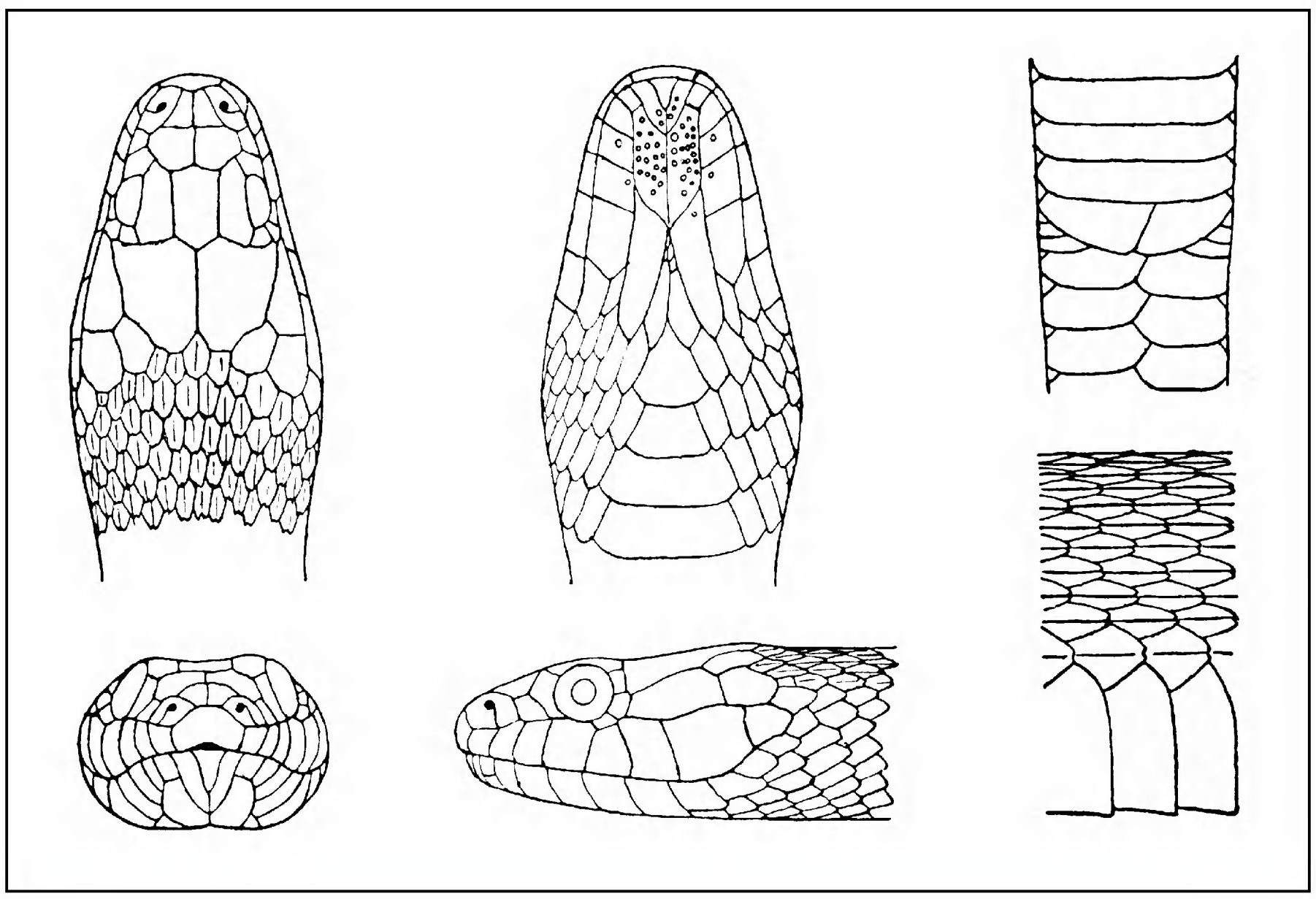
BULLETIN
of the
Chicago Herpetological Society

Volume 34, Number 11
November 1999



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The BULLETIN of the Chicago Herpetological Society (ISSN 0009-3564) is published monthly by the Chicago Herpetological Society.

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Bull. Chicago Herp. Soc. 34(11):241-245, 1999

Snake Venoms Inspire Newly Approved Drugs

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Extracting snake venom for research use seems to guarantee drawing a crowd and it doesn't seem to matter whether the crowd is expected or accidental—you are asked the same two questions hundreds of times in the course of a day's work. The first question unavoidably is, "Have you ever been bit?" That one is shrugged off with one of several deadpan responses such as, "My wife bit me once. . . . I nearly died." The other question I take to heart since I want the public to become aware of the amazing medical progress taking place through research with snake venoms in particular and other venoms from sources as disparate as spiders, sea cucumbers and hornets, to cite only a few examples. That question is, "What do you do with that stuff?" My response offers a long answer and a short answer, the short one being that the venom being extracted is used in medical research to develop new drugs and in the laboratory to study biological systems and to determine the structure of complex amino acids, for example.

If the listener's eyes haven't glazed over by this point, I try to go as deep into this fascinating subject as the attention span of the listener will permit. I have ulterior motives here. Not only do I want the public to realize that research into venoms is a serious and rewarding activity, but I also want an equal recognition that we as a species would be very foolish if we fail to conserve a resource such as venomous snakes—yes, that's right, venomous snakes! Most herp society members already know at least a little about this subject and do not need further reason to work for conservation of all reptiles including venomous snakes. But we all have family and friends who don't necessarily react to snakes as a herp society member does. This article, which you might consider a small part of the "long answer" to the much-asked question mentioned above, is intended to assist a herp society member in countering the old "good snake is a dead snake" attitude we all face.

In hopes that copies of this article can be given to non-reptile types and nonscientific types without the need for additional comment, the format is not that of a learned paper. I hope that this informal presentation will promote a greater understanding and appreciation of venoms and also the much-maligned creatures that produce those venoms.

A 1998 paper by Dr. Francis S. Markland [Snake Venoms and the Hemostatic System. Toxicon 36(12):1749-1800] is available as the most up-to-date technical overview of venoms and the hemostatic system, this being a particularly rewarding field of study to date, and one that holds terrific promise for future venom-derived drugs and new drug uses. Since many venom producers of the relatively recent past have greatly exaggerated venom utility, I make reference to pertinent United States patents as one way of documenting the material under discussion. Certain nonessential information comes from personal conversations with researchers in the various fields.

Those of us who are truly interested in venomous snakes, and particularly rattlesnakes in this part of the world, understand the need to insure that wild populations and habitat remain viable. We don't need additional justifications in order to appreciate the beauty of this largely unappreciated segment of our wildlife heritage. For those of us who already appreciate reptiles, the intent here is merely to inform. For those who could use a little shove toward a more "let live" attitude, the intent is to provide a little help in getting beyond the snake's association with "original sin" and the undeniable fact that a venomous snake can ruin your day or worse.

Although venoms have been the subject of study for well over 100 years, the last half of the twentieth century has seen the overwhelming bulk of this work—work that has only scratched the surface to date. Rather than start at the beginning, a difficult place to pinpoint at best, why not concentrate first on recent advances that have produced approved drugs and approved new uses for venom-derived drugs?

The Food and Drug Administration in 1998 approved a record number of new drugs derived from snake venoms. A number of other venom-derived drugs and new therapeutic uses for existing venom-derived drugs are either awaiting approval or are now undergoing clinical testing. Before long, just about everyone in the old US of A either will have benefited directly or will have a family member who has benefited from these new drugs and other drugs of recent origin that have been developed from research into medical uses of snake and other venoms.

The fact that medical science has found snake venoms to be an excellent source of biologically active substances with pronounced effects on the human body is not difficult to understand once you really think about it. Venoms have been developing in the hundreds of species of venomous snakes around the world since the snakes themselves began crawling around looking for a meal. Reptile venoms, other than the defensive, pain-inducing venoms of the two venomous lizards, have evolved over the millennia to damage the nervous system or the blood and tissue of small animals—particularly small mammals, which the snakes view as we would a seven-course feast. The faster the venom works its killing and predigestive functions on a prey animal, the sooner the snake will enjoy dessert, which is usually the tail of a rodent as the snake swallows his meal headfirst.

Although we might like to think otherwise, we humans don't differ all that much in the purely biological sense from a rat. Well, if that bothers you too much, how about a rabbit? Our tissues, our blood and circulatory system as well as our nervous system are profoundly affected by snake venoms. Amazingly small quantities of these venoms can produce the most dire of consequences. For this reason and the widespread

belief that Adam and Eve were tempted by none other than a snake, our reptilian neighbors have suffered an exceedingly bad rap over the ages. How things have changed! In view of the advent of these new life-saving drugs, how can an otherwise reasonable person, a person whose life may have been saved by treatment with COR Therapeutic's new drug, Integrilin, or Merck's Aggrastat, find as much pleasure as he once did in beating the bejabbers out of any snake unlucky enough to cross his path?

Even today, we owe a tremendous debt to drugs derived from snake venoms and that debt will increase tremendously within the very near future. Integrilin and Aggrastat, recently approved for use by the FDA, are synthetically produced versions of snake venom components known as disintegrins, a fancy name for a class of materials in snake venoms that bind to blood platelets so that the platelets will not clump up and form dangerous blood clots. Both of these new drugs are now available for use in preventing blood clotting such as often occurs during coronary angioplasty or as a result of unstable angina. Aggrastat in particular is being called "super aspirin," since it is effective in preventing heart attack. Aggrastat is not a material taken directly from a snake's venom but is a synthetic material chosen for use due to similarities in chemistry and function to a component of the venom of the saw-scaled viper, *Echis carinatus*, an African and Middle Eastern snake of relatively small size, which is believed to be responsible for more human death and injury than any other snake. Now even a snake with the most dastardly reputation imaginable has contributed to man's knowledge and provided a model for an extremely effective new life-saving drug.

Why did science even took at the chemistry of saw-scaled viper venom? Since man and this viper began their coexistence on this earth, it has been recognized that people bitten by this snake often bled to death. Obviously, something in this snake's venom prevented the normal clotting of blood. Taking this knowledge as a starting point, the chemical substance in the venom responsible for blood clot prevention was identified and a synthetic substitute found having the desirable anticlotting function without the deleterious effects of the venom itself. Proper dosages of this anticlotting synthetic substance have clearly been shown to prevent heart attacks in people who are at high risk.

Integrilin functions like Aggrastat, but was modeled after a platelet aggregation inhibitor known as barbourin, which is found in the dusky pigmy rattlesnake, *Sistrurus miliarius barbouri*, of the southeastern United States. Studies of this particular disintegrin, a peptide, were accompanied by studies of other, similar substances from rattlesnake and other pit viper venoms in an effort to locate the natural material having the greatest anticlotting effect. Integrilin was then synthesized as a smaller molecule modeled after the rattlesnake peptide. Integrilin not only prevents unwanted clotting, which can cause heart attack and stroke along with other dangerous conditions, but also can dissolve a blood clot very rapidly and thus stop a heart attack or stroke in its tracks. Integrilin and other similar snake venom-derived drugs are only a step away from widespread use in the emergency treatment of heart attack, stroke and other clot-related disorders. These drugs act more rapidly than prior drugs used for these same purposes. Rapid action was desirable to the snake when putting his dinner on the table and we can only be grateful that the snake developed this capability even if our future benefit was not foremost in the snake's mind.

Another use of disintegrins such as Integrilin is to coat the blood-contacting surfaces of equipment used to circulate the blood outside of the human body—during surgery, for example. In the past, a material known as heparin, an anticoagulant, has primarily been used for this purpose. The new venom-derived substances are proving to be more effective in preventing adhesion of blood platelets not only to each other but also to equipment surfaces during these kinds of surgeries. As the doctors would say it, these venom-derived disintegrins "enhance reperfusion" of blood back into the body.

Disintegrins can prevent blood platelet clotting regardless of the stimulating agent that may be the cause of the potential clotting. This is leading to research studies into situations where other integrins, that is, sites on cells of different kinds (other than blood platelets), can be blocked by the snake venom disintegrin to allow potential treatments for medical conditions such as osteoporosis and even breast tumors. Clinical studies already underway have shown reduction in bone loss with snake venom-derived disintegrin treatment. These disintegrins have also been shown in clinical studies to inhibit malignant cells such as in breast cancer pathologies from clumping together to form groups of malignant cells, which are, of course, the building blocks of cancerous tumors. The use of snake venoms for cancer treatment has been wrongfully touted in the past. However, this new work is for real and may result in more effective therapies for treatment of at least certain forms of cancer.

Another anticlotting drug recently brought to the U.S. market is Ancrod, a product of Knoll Pharmaceuticals, a division of the chemical giant, BASF. This drug is actually a material purified from the venom of the Malayan pit viper, *Calloselasma rhodostoma*. The purified material is an enzyme that eats away at and destroys fibrinogen, a material in blood that also causes clotting. The approved use of Ancrod at present is for establishing and maintaining anticoagulation in heparin-intolerant patients undergoing coronary bypass surgery. Approval of the use of Ancrod for administration after strokes is pending before the FDA. Ancrod, also known as Arvin and Viprinex, differs chemically from the disintegrin materials Integrilin and Aggrastat, and functions in a different way to prevent and break up blood clots. Other fibrinogen-clotting enzymes are being studied for possible utility in treatment of diseases involving unwanted clotting of blood and the resulting occlusion of the circulatory system. One of these enzymes is derived from the venom of the western diamondback rattlesnake and is known as atroxase.

An interesting new drug now being tested by Amylin Pharmaceuticals is modeled on a peptide found in the salivary secretions or venom of the Gila monster, *Heloderma suspectum*, the venomous lizard of the American Southwest. This synthetic material is known as Exendin-4 and has been shown

in clinical trials to increase the ability of the human body to produce insulin. Treatment of adult-onset diabetes will be the most likely use of this new drug, although it also appears to be useful in controlling metabolic disorders and lessening food consumption in obese animals, thus leading to reduction in body weight. Can't you see the headline in the *National Enquirer* now?

> "Super Model's Most Intimate Secret: Magic Treatment Based on Alien Gila Monster Potion Keeps Me Looking Anorexic"

We then have in a single story the four primary subjects beloved of these publications and additionally the inclusion of a reptile playing the usual role of the thing that goes "bump" in the night.

Please forgive that digression. Everything in this article is factual but here I couldn't resist poking a little fun at my favorite obscenity, the tabloids.

The reader should be reminded that several snake venom enzymes are now being used in diagnostic testing. One of these enzymes is separated from venom of the southern copperhead, *Agkistrodon c. contortrix*, and is known as Protac, a product of American Diagnostica. Reptilase is also a blood-testing enzyme separated from snake venom—in this case by Pentapharm, a Swiss company. Other snake venom components are used in diagnostic testing, usually the testing of blood.

Just about everyone knows that snake venoms are used to make "antivenom" for treatment of those unfortunate few who are bitten by venomous snakes. In this use of venoms to save lives, venom is injected into a horse or other suitable host animal, which then produces "antibodies" to the venom. These antibodies are essentially identical to the antibodies produced by our own immune system in the event of snakebite. The antibodies are removed from the horse's blood and "packaged" for subsequent use. Effective treatment of serious snakebite requires that more antibodies be introduced into the patient's blood than can be immediately produced by the immune system and these larger amounts of antibodies need to be introduced quickly in order to bind with the snake venom antigens to limit damage to the blood and tissues and, in the case of snake venoms with neurotoxic properties, the nervous system. The packaged antibodies from the horse are given intravenously to quickly boost antibody levels in the blood to counter the effects of the venom.

While the North American polyvalent has long been the exclusive turf of Wyeth, a new antivenin using sheep as the host animal and with venoms obtained within the United States as antigens is making its way to the market. This new material is produced by Therapeutic Antibodies of Nashville, Tennessee, and purports to be safer than the Wyeth material due to selection of the host animal as well as removal of a deleterious antibody fragment. At least some of the work leading to this new antivenin has resulted from research conducted at the University of Arizona.

Rattlesnake venom enzymes have long been used in the laboratory to study such things as the structure of complex amino acids or, as the scientist might say, for the elucidation of the polynucleotide base sequence. It doesn't matter how you say it, research into biological systems just could not be accomplished as well as it has been and is today without enzymes such as phospholipase and phosphodiesterase obtained from snake venoms and particularly rattlesnake venoms.

Those paying attention to the new drugs (approved in 1998) discussed above will have noticed that these drugs are "venom-derived"; that is, a particular material in a venom has been used as a "molecular model" for development of a synthetic pharmaceutical possessing the desirable properties of a snake venom fraction that was initially discovered to have a therapeutic benefit. Even though the recently approved venom-derived drugs hold tremendous promise, the most successful drug synthesized from a snake venom model remains the blood pressure medicine, captopril, which has been available for a number of years as Capoten from Bristol-Myers Squibb. Besides use as an antihypertensive, captopril now stands approved by FDA for promoting healing of the heart muscle after a heart attack, for preventing a second heart attack, for treatment of congestive heart failure and for treatment of diabetic patients who suffer from kidney disease.

Captopril is an excellent example of the use of venoms as "teachers," my favorite kind of research result. I truly believe that the established venom laboratories, certainly the three laboratories that have been in business for over 20 years, including the small company I have worked with for years, would not welcome a research development that would require venom production levels potentially destructive of entire populations of any snake species. I for one appreciate the beauty of venom research that culminates in a valuable product and in the ability to manufacture a resulting medication synthetically. Although venom laboratories might benefit financially at least in the short term by a research breakthrough requiring very large quantities of a given venom, the cost to the environment and to the very existence of one or more species could be undesirable and unintended results of such a circumstance.

Captopril is a synthetic version of peptides known as ACE inhibitors, which have been isolated from pit viper venoms including rattlesnakes and the "lance-headed" snakes of Central and South America. Venom from the snake *Bothrops jararaca* of South America figured prominently in this work as did certain United States rattlesnake venoms, which were also used to characterize the functions and structures of ACE inhibitors. Captopril was first used to lower blood pressure in patients suffering from a particular kind of blood pressure disorder. Subsequent uses as mentioned above have only recently been approved by the Food and Drug Administration.

Before we go any further, I want to make sure that we all understand just what happened in the research that led to the development of captopril. Captopril itself does not contain snake venom. Captopril was developed using certain substances found in snake venoms as the model for the synthetically-produced final product. This is akin to making a fake fur coat using a leopard's spotted pattern as the inspiration for the fake fur. With the fake fur, however, the leopard is allowed to keep his spots and is no worse for wear. In essentially the same way, captopril "looks like" a portion of a snake venom

compound that is classified as a peptide. This peptide actually "taught" researchers just what needed to be synthesized in order to produce a drug that would act on the human body in essentially the same way as does the snake venom peptide.

Scientists first came to a belief that something in pit viper venoms might be useful as an antihypertensive drug, that is, a drug capable of lowering blood pressure, due to a recognition that severe pit viper envenomation often resulted in very substantial drops in blood pressure, a condition that is itself life threatening. Researchers began looking for the chemical compound or chemical mechanism in pit viper venoms responsible for the severe relaxation of blood vessels and the accompanying precipitous drops in blood pressure. Certain proteins known as peptides present in pit viper venoms were found to inhibit a natural enzyme in the human body that normally converts a natural substance in the blood, a substance known as angiotensin I, to a substance known as angiotensin II. This angiotensin II, when present in the blood in abnormally high concentrations, causes high blood pressure or hypertension. By preventing the natural enzyme in the blood from converting angiotensin I to angiotensin II, the snake venom peptide was found to be useful in controlling high blood pressure caused by this angiotensin conversion. The converting enzyme itself has come to be known as angiotensin-converting-enzyme while the snake venom peptide has come to be referred to as an angiotensin-converting-enzyme inhibitor or ACE inhibitor.

While Squibb Pharmaceutical patented the snake venom peptides for use as antihypertensive agents (U.S. Patents 3,832,337 and 3,973,006) and could have used these peptides straight from the snake's mouth, certain problems existed in using the natural snake venom peptides. Primarily, the snake venom peptides were extremely large molecules and therefore had to be injected by hypodermic needle since the peptides could not be absorbed through the mucosal membrane of the stomach. Of course, taking medication by mouth is much preferred to injection by needle. Perhaps from a public relations standpoint the researchers also realized that using a needle to inject an actual snake venom peptide into the body too closely resembles injection of venom through the fangs of a snake!

Since the venom peptide molecule was too large for oral administration, the Squibb researchers began a study aimed at determining whether a small part of the peptide molecule actually caused the desired result. A synthetic molecule of sufficiently small size, and which retained the desired function, would solve a number of problems, not the least of which being the difficulty of obtaining large amounts of snake venom for production of the peptide. This work was successful and it was found that a relatively small portion of the venom peptide molecule could be synthetically produced in the form of a simplified amino acid structure that could be readily absorbed into the bloodstream through the stomach. The new synthetic drug, which was patterned after the snake venom peptide, could therefore be taken orally in tablet form. U.S. Patents 4,046,889 and 4,105,776 were then obtained by Bristol Myers Squibb, the successor company to Squibb. These patents described for the first time the low molecular weight synthetic drug, which could be taken orally. This drug includes an active chemical structure that causes depression of blood pressure in essentially the same way as do the pit viper venoms themselves when the snakes bite a rodent for a meal or a human being as a warning.

Just for the record, the chemical structure fashioned from the snake venom peptide is a terminal amino acid known as pyroglutamic acid. This synthetic amino acid in appropriate amounts causes a slight relaxation of blood vessels, thereby lowering high blood pressure resulting from overproduction of angiotensin II in the human body.

All of this has come about because of the recognition of the biological effects of envenomation and research into snake venoms that "taught" medical researchers how to make a drug that can be easily absorbed by the body. Without the "model" provided by snake venoms, we would not have this one particular drug available to us. It is estimated that captopril has annual sales of over two billion dollars and will likely enjoy a four billion dollar annual market by the year 2000 due to other uses that have recently been approved by the Food and Drug Administration.

It is interesting to note that no Bristol Myers Squibb materials that I could find mention that their prized drug originated from a model provided by snake venoms. Apparently, the pharmaceutical industry remembers the unsuccessful early '70s pain drug, Cobroxin, which actually included the alpha-toxin of the Siamese cobra, *Naja n. kaouthia*, as the active ingredient.

This work is a primary example of the manner in which snake venom components will likely be of greatest value to man, that is, by supplying "molecular models" that can be used to synthesize new pharmacologically active materials. Of course, it is actually better that we don't have to milk every pit viper in existence to produce such materials. It is much better that the new drugs be synthetic and engineered so that they can be taken by mouth rather than injected.

Certain "blue sky" uses of venoms and venom components such as nerve growth factor remain on the horizon. When nerve growth factor was first discovered over 30 years ago, it seemed to be no more than a strange biological side show. It caused nerve cells in embryonic chicks to grow much faster than normal. Now nerve growth factor is being studied as a potential treatment for degenerative neurological disorders including Alzheimer's disease. Treatments of this type are far from being proven. However, Alzheimer's patients have shown improvement after treatment with snake venom nerve growth factor. Since the mechanisms by which snake venom nerve growth factor apparently work involve the creation of new nerve cells, you may wonder whether it is possible to replenish some of those millions of brain cells we lose over time due to the normal aging process. Could snake venom fractions, or synthetic versions thereof, show us the way to treatment of insidious diseases such as Alzheimer's? Or, on the lighter side, make us as smart as we used to be—or thought we were? Dermal growth factors present in snake venoms may also lead to burn treatments and even cosmetic "relief" for that most hideous of conditions, wrinkles.

Getting back to known reality, other medicines available in

the world today do actually use chemical compounds that come directly from a snake's venom. In the situation involving captopril, no part of the medicine comes directly from a snake's venom. As we have seen in the case of captopril and in several of the venom-derived drugs recently approved for use, a study of snake venom led to the discovery of a venom fraction that was then produced synthetically in the laboratory. Meeting the demand for a medicine such as captopril through an actual use of snake venom per se would be impractical. Major developments now on the horizon, including the disintegrins, will most likely follow the captopril model, with venoms teaching man how to produce useful drugs synthetically rather than actually comprising the drug. The snakes would surely approve of this approach.

Given these amazing contributions to human health brought about by snake venoms, maybe snakes should be looking for a little better treatment from us.

Bull. Chicago Herp. Soc. 34(11):245-249, 1999

Comments on Holarctic Pleistocene Herpetofaunas

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Introduction

At present, the literature on Pleistocene vertebrates is completely dominated by studies on mammalian faunas (see comments in Holman, 1995 and 1998). Mammals are not only utilized to determine Pleistocene stratigraphic relationships (e.g., Woodburne, 1987), but to determine Pleistocene climatic and ecological patterns as well (e.g., Martin and Klein, 1984). The other vertebrate groups, fishes, amphibians, reptiles, and to a lesser extent, birds, have been neglected in these interpretations. Thus, the purpose of this paper is to comment on some important biological and geological aspects of Nearctic and Palearctic (= Holarctic) Pleistocene herpetofaunas in order to stimulate more research on Pleistocene herpetofaunas of the region.

The Holarctic Pleistocene Herpetofauna

Perhaps the most striking aspect of the Holarctic Pleistocene herpetofauna is the fact that it has changed very little during the epoch, although in the mammals and to somewhat lesser extent, the birds, devastating Pleistocene extinctions occurred at the familial, generic and specific levels. In essence, the large extinct mammals that dominated the Pleistocene have been largely replaced by domestic ones, and the native grasses upon which they fed by grass crops such as oats, wheat, maize, barley and rice. The Pleistocene herpetological stasis will be discussed in more detail later.

The Modern North American and European Herpetofauna Compared

Comparatively speaking, the modern North American herpetofauna is taxonomically rich and that of Europe is poor. This is largely based on the differing geography of the two regions and differing historic climatic events in each area. The comparison starts early in the Tertiary. Because of the deteriorating climate in the late Eocene and Oligocene, there was a marked reduction in amphibian and reptile groups in both North America and Europe (Holman, 1998).

A more favorable climate in the Miocene saw an enriched Holarctic herpetofauna. But later in geological time, deteriorating climates and European isolation from southern land masses because of rising mountain ranges and the presence of the Mediterranean Sea, led to a depauperate Pleistocene and modern European herpetofauna.

At the height of the late Pleistocene, northwestern Europe was essentially blanketed by ice (Figure 1). In North America, however, the maximum penetration of the late Pleistocene (Wisconsinan) glacier was in the form of a lobe in the Great Lakes region where the ice penetrated southward to almost identical latitudes in Ohio, Indiana and Illinois (Figure 2).

Thus in North America, with a vast, accessible, southern land mass warmed by air currents from the Gulf of Mexico (Figure 3), and with equable Pleistocene climates south of the periglacial areas (Holman, 1998), the richness of the Miocene herpetofauna persisted into the Pleistocene. Moreover, after the ice retreated, a relatively rich herpetofauna was able to reinvade formerly glaciated areas (see Holman, 1995 and 1998).

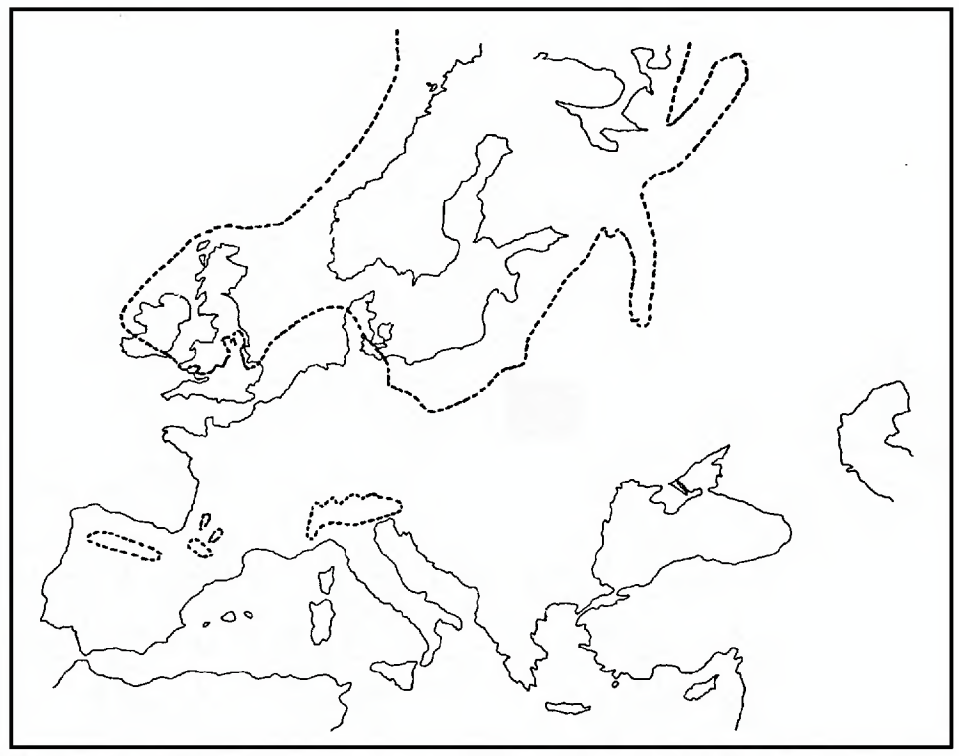

Figure 1. Ice cover (areas surrounded by broken lines) in Europe about 18,000 years ago.

For instance, in Michigan, a northern border state, 11 species of turtles (*Trachemys scripta* was probably recently introduced) are present in the modern herpetofauna. This is because turtles and other herpetological species were able to reinvade Michigan (which was completely covered with ice 18,000 years ago) from a climatically equable land mass in the south. This is very much in contrast with western and central Europe, which are inhabited by only six nonmarine turtle species.

A relatively warm, equable climate, able to sustain a moderately rich turtle fauna, existed only about 150 km south of the ice front in Indiana during full glacial times (Holman and Richards, 1993). This pattern was repeated in all of the other herpetological groups in the Great Lakes region. In fact "cold" Michigan presently has as many snake species as "hot" Spain, a Mediterranean country (compare Conant and Collins, 1998, with Barbadillo, 1987).

In summary, the availability of a large North American land mass in full glacial times, with an equable climate, enhanced by warm Gulf air masses, not only allowed continuous maintenance of an enriched North American herpetofauna in the south, but also allowed for the reinvasion of previously ice-covered areas by many herpetological species.

Holarctic Herpetological Species as Pleistocene Climatic and Habitat Indicators

Most Holarctic Pleistocene amphibians and reptiles are living today. Thus, conventional wisdom has it that one can assume that Pleistocene amphibians and reptiles had essentially the same ecological tolerances and habitat preferences that they presently have. Moreover, many scientists have assumed that being ectotherms with supposedly more sensitivity to temperature changes than birds and mammals, herpetological species are better indicators of climatic conditions. Additionally, it has been argued that most amphibian and reptile species are more spatially confined than endotherms (especially large birds and mammals) and thus are better indicators of microhabitats and microclimates (Holman, 1998).

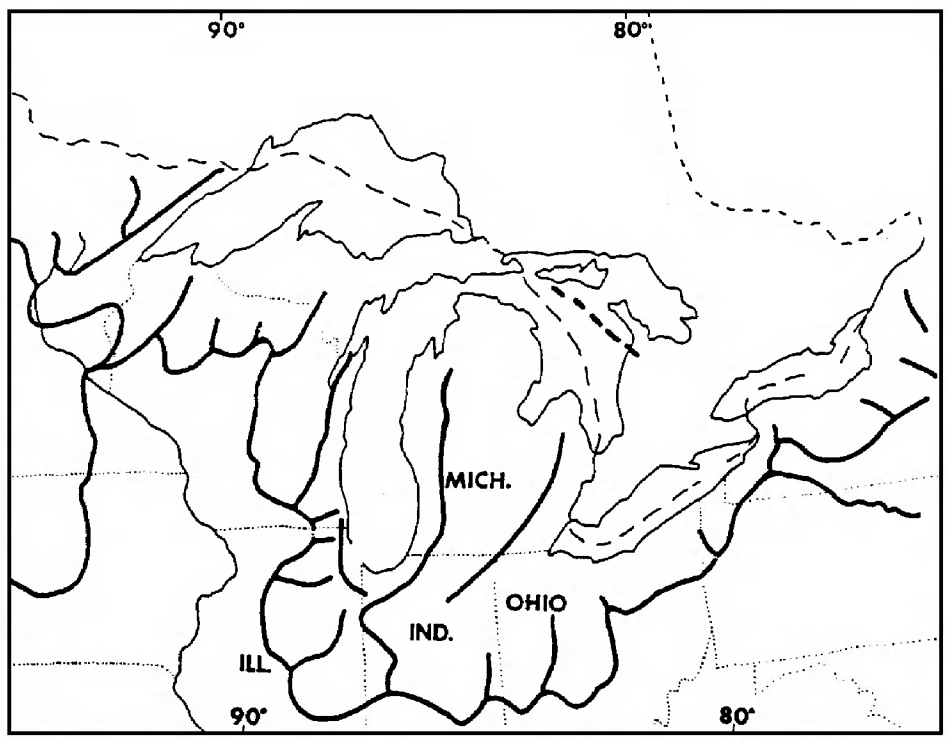

Figure 2. Maximum extent of the ice (heavy lines) in North America about 21,000 to 20,000 years ago.

Indeed, there is no doubt that some amphibians and reptiles are restricted to very limited and sometimes delicate environmental situations. The tiny bog turtle (*Clemmys muhlenbergii*) is a North American species that, like a mouse or vole, utilizes tunnels in specific bog habitats. If found as a Pleistocene fossil, the bog turtle would indicate such a habitat.

In Europe, *Proteus anguinus*, an elongate paedomorphic salamander that is essentially blind, occurs in the lightless zones in caves along the northeast Adriatic seaboard and in northern Italy. *Proteus* lives in water ranging from about 40 to 50°F throughout the year. *Proteus* sp. has been tentatively identified from a cave in southern Germany, north of its present range. If the identification is correct, and modern cave temperatures are taken into consideration, a warmer mean annual climate would be indicated for that area of Germany in the Pleistocene.

Turning to the New World, many North American plethodontid salamanders are restricted to specific habitats such as waterfalls, outcrops composed of specific rock types, and altitudinal vegetational associations. Appalachian salamanders with present-day altitudinal distributions are very important in evaluating paleoclimates if the animals are found as Pleistocene fossils.

The European pond turtle (*Emys orbicularis*), presently absent in Britain, needs a mean July temperature in excess of 18°C for its eggs to hatch (Stuart, 1979). The modern summer climate of Britain is usually too cool to provide such warm temperatures; thus introductions of *Emys orbicularis* into southern Britain have repeatedly failed. On the other hand, there are many British records of *Emys orbicularis* during Pleistocene temperate stages. These records indicate that summer temperatures were higher during these intervals.

In North America, large species of land tortoises of the genus *Geochelone* (Figure 4) have long been used as "paleothermometers" by Pleistocene paleoherpetologists. These land tortoises, some of which were much larger than modern Gala-

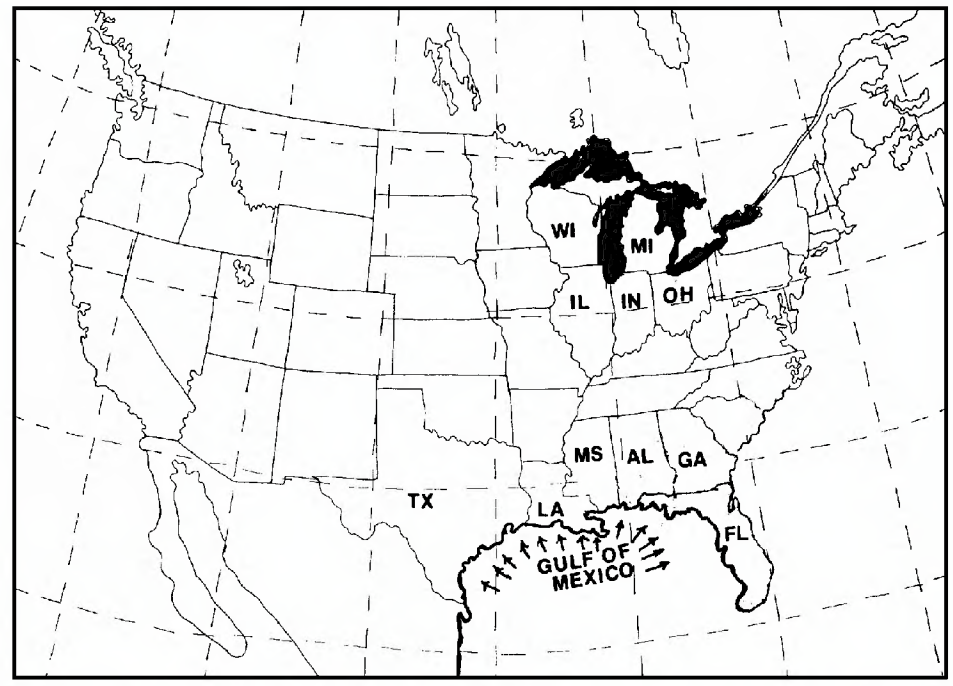

Figure 3. Hypothetical direction of warm air mass movements from the Gulf of Mexico during the Pleistocene of North America. The labeled southern states were home to giant tortoises in both glacial and interglacial stages in the Pleistocene. Massive reinvasions of herpetological species took place in the labeled Great Lakes states during glacial withdrawals.

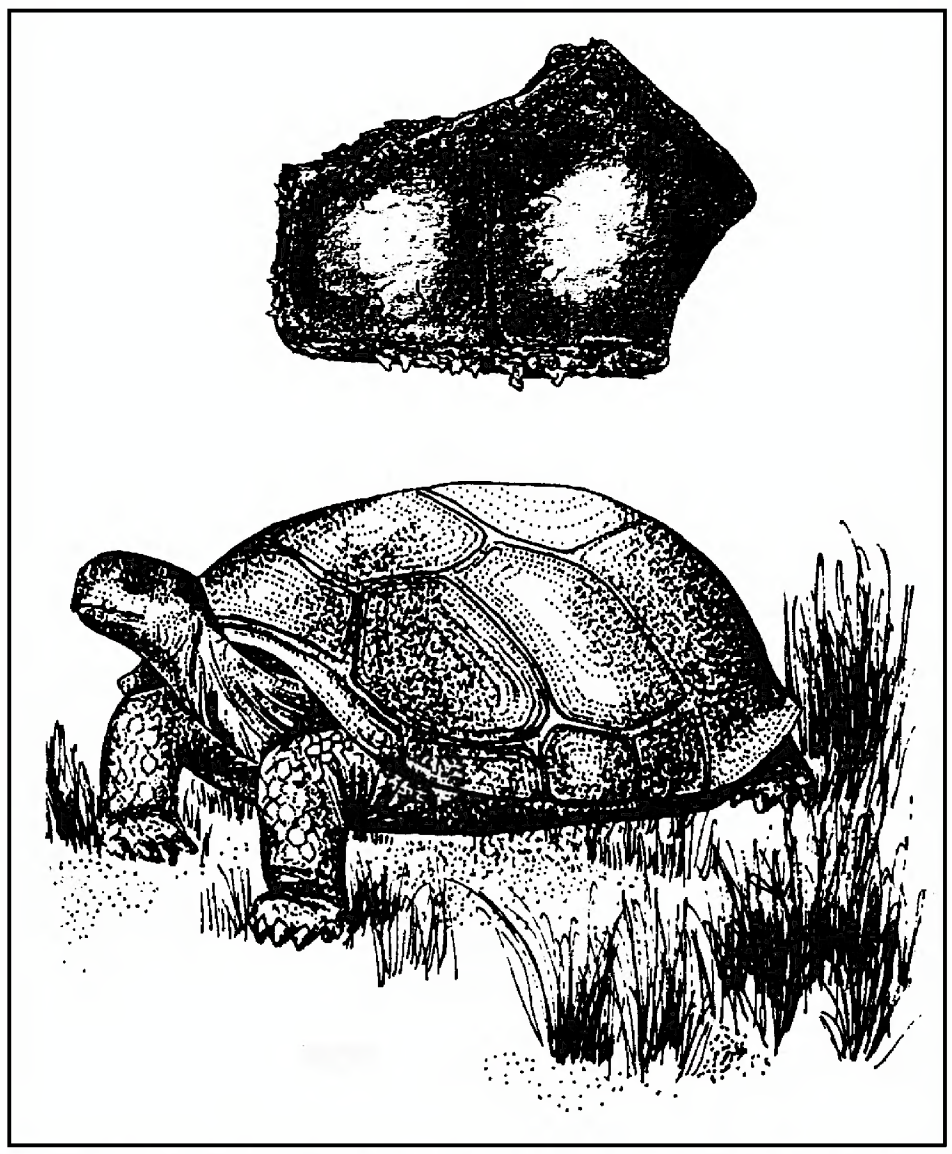

Figure 4. Upper, a plastral plate from a giant tortoise (*Geochelone crassiscutata*) from the Sangamonian (last interglacial stage) of the Hopwood Farm Locality, Montgomery County, Illinois.

pagos Island tortoises, occurred in the southeastern United States (see Figure 3) during both glacial and interglacial stages (Holman, 1995). Moreover, they reached as far north as central Illinois and southern Indiana during interglacial stages. Based on the present temperature requirements of giant land tortoises, one can assume that the areas where they were found in the Pleistocene had very mild climates with few, if any, hard freezes.

But there are many amphibians and reptiles that are broadly tolerant to environmental conditions, some species being very widely distributed in both the north and the south. The common frog of Europe (*Rana temporaria*) presently has a huge range that includes both far northern and southern Europe. It not only occurs in many interglacial faunas in Britain and Europe, but is often the only herpetological species present in full glacial faunas of the region. For a long time the adder (*Vipera berus*) and the viviparous lizard (*Lacerta vivipara*), which both presently live in the far north as well as in high areas in the south in Europe, were the only reptiles known from British cold stages (Holman, 1998). The grass snake (*Natrix natrix*) has now been reported from a single Devensian (= Wisconsinan in North America) deposit in Britain, but this deposit may actually represent a relatively warm part of that generally cold stage.

In North America, several species of anurans and at least one species of turtle are not only very widely distributed, but have the ability to freeze solid in the winter and thaw out successfully in the spring. The anurans are the wood frog (*Rana sylvatica*), the spring peeper (*Pseudacris crucifer*), the chorus frog (*Pseudacris triseriata*) and the gray treefrog (*Hyla versicolor*). Hatchling painted turtles (*Chrysemys picta*) can successfully freeze solid while hibernating in the nest.

To summarize the last few paragraphs, some Pleistocene herptiles may have had such broad ecological tolerances that they are not particularly indicative of any particular climate. On the other hand, if one finds only the highly cold-tolerant herpetological species in a fauna one can assume that a rather cool climate is indicated.

The German paleoherpetologist Gottfried Böhme (1996) has defined certain assemblages of amphibians and reptiles that indicate Pleistocene climatic stages in central Europe. As yet, such a model has not been derived for North America. These central European assemblages are as follow:

1. The common frog (*Rana temporaria*) tends to be the only species present in ice-free areas during full cold stages.

2. Early invaders during the latter part of a cold stage are the common toad (*Bufo bufo*), the moor frog (*Rana arvalis*) and the adder (*Vipera berus*).

3. Invaders during the initial part of a warm phase are the agile frog (*Rana dalmatina*), pool frog (*Rana lessonae*), warty newt (*Triturus cristatus*), smooth newt (*Triturus vulgaris*), slow worm (*Anguis fragilis*), sand lizard (*Lacerta agilis*), smooth snake (*Coronella austriaca*), and grass snake (*Natrix natrix*).

4. Species characteristic of optimum warm climates are the fire salamander (*Salamandra salamandra*), fire-bellied toad (*Bombina bombina*), common treefrog (*Hyla arborea*), common spadefoot (*Pelobates fuscus*), marsh frog (*Rana ridibunda*), green lizard (*Lacerta viridis*), Aesculapian snake (*Elaphe longissima*), and European pond turtle (*Emys orbicularis*).

5. The first invaders during the latter part of a warm stage are the natterjack toad (*Bufo calamita*) and the green toad (*Bufo viridis*).

6. Species that are characteristic of an outgoing warm stage and the beginning of a cold stage are the common frog (*Rana temporaria*), green toad (*Bufo viridis*), viviparous lizard (*Lacerta vivipara*), and adder (*Vipera berus*).

Are Pleistocene Herpetofaunas Stratigraphically Important?

Because herpetological taxa often evolve so slowly, and since the Pleistocene herpetofaunas of Europe and North America have essentially remained in stasis through the epoch, it might be reasoned that herp species have no stratigraphic importance in Pleistocene sites. On the other hand, as Böhme (1996) has attempted to show, certain assemblages of herps may indicate certain phases of climatic cycles.

Thus, if the cold-tolerant *Rana temporaria* is the only herpetological species in a large Pleistocene vertebrate fauna that contains boreal and arctic mammals, one must admit that *R. temporaria* supports the interpretation that the fauna represents a cold stage of the Pleistocene. On the other hand, if the Pleistocene occurrence of *Emys orbicularis* and *Elaphe longis-*

sima is far north of the present range of these species in Europe, there is little doubt that a warm stage is represented.

In other words, herpetological species may not determine the particular stratigraphic or biochronological age of a Pleistocene deposit, but they certainly are of great use in determining the *type* of stage that is represented, whether it be warm or cold. Moreover, considering Böhme's central European model, assemblages of herpetological species may even help to determine the specific climatic phase (e.g., late warm, early cold, etc.) represented.

Population Range Adjustments in Holocene Herpetofaunas

Population range adjustments occurred in both Europe and North America due to changing climates and the obliteration of habitats by ice coverage. But because of the contrast between glacial and interglacial climates in Europe and North America, Pleistocene herpetological events differed markedly in the two regions.

In Britain and northwestern Europe, in full glacial times (see Figure 1), land masses as well as the surrounding seas froze over, causing bitterly cold climates in the ice-free areas. Moreover, glaciated mountains occurred in Spain, France, eastern–central Europe, and even in the Balkans.

North America, however, even though a lobe of ice extended far into Ohio, Indiana, and Illinois (see Figure 2) in the last full glacial episode (and even a little farther south in these states in a previous glacial stage), warm air masses from the Gulf (see Figure 3) contributed to an equable climate in areas as close as 150 km to the ice front (see Holman and Richards, 1993).

Thus, south of the periglacial areas in North America, the herpetofaunas tended to stay in place in both glacial and interglacial times. In fact, Pleistocene herpetofaunas in all unglaciated regions in eastern North America from Pennsylvania to Ohio and southward to the Appalachians tended to be composed mainly of species that presently live in the fossil site areas (Holman, 1995). This is believed to be due to the equable climate that existed south of the periglacial ice-free areas in both glacial and interglacial times.

In Britain and Europe, however, the glacial climates were so severe that the very cold-tolerant *Rana temporaria* often was the only herpetological species present in ice-free areas during full glacial times. Moreover, contrasting with North America, many of the interglacial herpetofaunas in Europe became much more enriched than they presently are.

Stasis in the Holarctic Pleistocene Herpetofauna

We now return to the remarkable evolutionary stasis of the Holarctic Pleistocene herpetofauna. The one very notable similarity between European and North American herpetofaunas is, that when one compares mainland Pleistocene herpetofaunas, one finds that only one out of 73 identified species in Europe (1.4%) is an undisputed extinct species and in mainland North America only 10 out of 229 identified species (4.3%) are considered to be extinct. Moreover, I suspect that in years to come, some of the North American Pleistocene species will become synonymized with living taxa. Parenthetically, these figures are based on a North American Pleistocene time span that is considered to be somewhat longer than the European one (see Holman, 1998).

Nevertheless, the Holarctic herpetofauna has mainly been in stasis for nearly the last two million years. Perhaps the most stunning aspect of this is that an industrialized, environmentally exploitive human society has placed hundreds of amphibian species and who knows how many reptile species in jeopardy in a mere instant of geological time!

The most compelling scientific question raised about the Pleistocene herpetological stasis is probably, "What attributes have allowed the herpetofaunas to survive the stresses that have caused such dramatic extinctions in other vertebrate classes during the Pleistocene?" Future studies relative to this question might look in the following directions:

1. One would expect that ectothermic animals with a low metabolic rate that can aestivate and hibernate (brumate) would have the advantage over endothermic animals during times of climatic oscillations. Continuing studies of brumation patterns in amphibians and reptiles should be important in the interpretation of Pleistocene adjustments. For instance, successful "freezers" should have advantages over "non-freezers" in rapidly deteriorating climates. Oddly, the highly cold-tolerant *Rana temporaria* is unable to survive freezing.

2. North temperate amphibians and reptiles are relatively small and there is obviously an advantage to smallness in times of shrinking habitats, especially when these small animals are compared with the large endotherms, particularly the huge herbivorous mammals (megaherbivores) that dominated the terrestrial biota in the Pleistocene.

3. A compelling possibility exists that few Pleistocene amphibians and reptiles depended directly on the megaherbivores that became extinct during the Pleistocene, either as predators, scavengers, or commensals. In the famous Rancho LaBrea Site in California, the scavenging or commensal birds and dung beetles became extinct along with the megaherbivores upon which they depended. On the other hand, all of the Rancho LaBrea amphibians and reptiles survived into the present (Holman, 1995). But in Australia, the giant monitor lizard *Megalania* and the huge snake *Wonambi* (Murray, 1984) were top predators and probably became extinct because so many large marsupial herbivores died out.

For some reason, few suggestions have been made in Pleistocene studies about the possible ecological relationships of amphibians and reptiles to the large megaherbivore-dominated communities of the Pleistocene. It might be that herpetological species existed well outside of the web of interactions that took place between the large mammalian herbivores and their predators and scavengers. Studies of how small amphibians and reptiles may or may not tie into the food web in modern megaherbivore-dominated communities such as occur in Africa might be interesting.

5. Parenting in endothermic birds and mammals is part of

the reproductive stress syndrome and would appear to be a considerable drain on their energy during times of climatic change. Advanced parenting behavior is lacking in amphibians and non-crocodilian reptiles.

6. For decades human overkill has been suggested as a possible major reason for the extinction of the large Pleistocene mammalian herbivores and their predators, scavengers and commensals (see Martin and Klein, 1984). The less desirable aspect of Pleistocene amphibians and reptiles as human food in terms of energy spent in getting small, seasonally available animals, compared with energy spent in getting large mammals might also have been a factor in the low extinction rate in the small members of the Pleistocene herpetofauna. Conversely, the large, extinct Pleistocene land tortoises would have been an easily obtained, energy-efficient food resource for humans. Certainly, additional studies of predation on Pleistocene amphibians and reptiles by humans in the Holarctic region is needed.

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Note: This paper is based on a presentation by the author at the Society of Quaternary Studies Symposium, Kerkgrade, the Netherlands, September 1998.

Bull. Chicago Herp. Soc. 34(11):250, 1999

Reproductive Senescence of the Neotropical Rattlesnake, *Crotalus durissus cascavella* (Serpentes: Viperidae)

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The information regarding the maintenance of pitvipers in captivity is relatively scanty (Murphy and Armstrong, 1978). Captive maintenance of rattlesnakes has been an interest of Instituto Butantan because of the use of rattlesnake venom in serotherapy. Since the founding of the institute in 1901, many colonies of venomous snakes have been kept for breeding and extraction of venom, but to date the relationships between age and senescence of venom or reproductive ability have not been established. Some species show high levels of adaptability, and longevity records of 10 years are not uncommon (Murphy and Armstrong, 1978). A male *Crotalus horridus* lived 36 years in captivity and exhibited signs of senescence, such as inability to kill its prey and difficulty with digestion, from the age of 25 (Cavanaugh, 1994). Evidence about the reproductive status of aging snakes, either male or female, is inconclusive (Patnaik, 1994), but the consensus is that the initiation of secondary vitellogenesis, usually a response to environmental cues (Fitch, 1970: 212-213), can be lost in captivity (Aldridge, 1979).

This work reports on the reproductive stage of a female *Crotalus durissus cascavella* (snout–vent length 123.0 cm; tail length 7.0 cm; weight 1645 g; 16 rattle segments), captured in the state of Ceara, northeastern Brazil (5°00 S; 40°00 W) and brought to Instituto Butantan. After 29 years in captivity (20–27°C; under natural photoperiod regime; fed on mice or rats every 20 days; without any signs of senescence), in the month of April (austral autumn), the snake was found dead. Dissection showed the presence of 14 and 9 follicles in the right and left ovaries respectively (10–16 mm) in secondary vitellogenesis. The snake was then preserved and deposited in the museum collection "Alphonse Richard Hoge," I.B. 54627. Observations of rattlesnakes (*C. d. terrificus*) of both sexes kept together in captivity, in the state of São Paulo, southeastern Brazil (22°00 S; 49°00 W), showed that females could reproduce until the age of 28, exhibiting a biennial cycle and producing normal offspring (Cais, pers. com.).

The above data confirm that *C. d. cascavella* maintained its natural reproductive cycle, similar to *C. d. terrificus*, which shows mating and secondary vitellogenesis in autumn, ovulation in spring and birth in summer as described by Almeida-Santos and Salomão (1997). Lira-da-Silva et al. (1994) also recorded birth of *C. d. cascavella* in summer, corroborating our findings. These reproductive events show the same pattern observed in closely related rattlesnakes from the temperate region, particularly the North American rattlesnake. Therefore, Neotropical rattlesnakes seem to present slow senescence, not only based on continuous growth, but also based on the ability of aging individuals to reproduce.

Acknowledgements

We thank Prof. Dr. Arif Cais, head of the Department of Zoology, Universidade Estadual Paulista (UNESP), São José do Rio Preto, SP, Brazil, for the information on *Crotalus durissus terrificus*; Jairo Mendes de Souza and Valdir José Germano, Laboratório de Herpetologia, Instituto Butantan, for technical support in the bioterium activities.

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Bull. Chicago Herp. Soc. 34(11):251-253, 1999

A Population Survey of the Brazos Water Snake, *Nerodia harteri harteri*, and Other Water Snakes on the Brazos River, Texas, with Notes on a Captive Breeding and Release Program

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Introduction

The Brazos water snake, *Nerodia harteri harteri*, found only in the Brazos River of central Texas and first described in 1941, has become difficult to find. While it may be too early to say that the Brazos water snake is on the verge of extinction, the low numbers have some herpetologists concerned. This light-bodied, tan-colored water snake with a pink belly is only known from about 100 miles of the upper reaches of that river, where they were once common in the fast flowing riffle areas. They are known among herpetologists as one of the fastest moving of all North American water snakes, an adaptation for living in those fast moving waters, where they must hunt small fish. What may be even more stunning than their reduced numbers is the speed at which they appear to have declined. Only four years ago, they seemed to be much more common.

Surveys made by several experienced herpetologists from March through July 1999 had failed to reveal any of these snakes (Bartlett, pers. com.), until one nongravid adult female was found on 14 July. Ironically, it was found at the site where the species was first discovered. Other Brazos water snakes have been found this year by fishermen and perhaps other herpetologists, but their numbers appear to be drastically reduced.

Because of the speed with which the numbers have been reduced, many herpetologists and government agencies may be taken entirely by surprise. The state has not performed a recent survey that can be compared to previous surveys, and there is no guarantee that the government will be able to act before it is too late. Surveys conducted during the fall will be critical, since spring and summer surveys often reveal lower numbers than what may actually be present. Interestingly, the Concho water snake *Nerodia harteri paucimaculata*, which appeared to be much more at risk than the Brazos water snake because of its more restricted range (and was the recipient of federal protection), may now actually have a more stable population than its once more numerous relative.

Hypotheses for their apparent reduction include habitat destruction due primarily to the construction of dams. The dams slow down the rate of water flow, and cause the river to be deeper over most of its course than it was previously. Aside from inundating large areas by forming lakes, this has changed the remaining river by reducing the number of riffle areas, reducing their quality (more of the rocks are now under water), and increasing the distance between riffle areas (Tennant, 1984, 1985; Scott et al., 1989). Furthermore, the slower moving water has allowed more soil to be deposited along the edge of the river, with the resultant growth of plants right down to the water's edge. Riffle areas are considered essential for the survival of babies, who need the shallow areas to hunt small fish without becoming the prey of larger fish, and need the shoreline rocks for cover (Tennant, 1984; Scott et al., 1989). In addition to the apparent reduction of suitable habitat, another ominous change appears to be occurring. Other species of water snakes appear to be increasingly common, and competition may become a more significant factor.

Survey Methods and Results

From 14 through 18 July we completed a rigorous four-day canoe and bridge survey of the section of the river known historically to support the largest number of Brazos water snakes. This included an approximately 20-mile stretch of river with the center at Route 4, north of Palo Pinto, in Palo Pinto County. The habitat along the shoreline was studied and compared with the same area six years ago. Every rock that could be turned was turned, and all basking areas were visually examined. Snakes of all aquatic species were collected if possible, and then weighed, measured and sexed. Several had their mouths cultured for bacterial identification. Fecal exams were performed if possible. Regurgitated food items were examined, measured and weighed. The snakes were then released.

We observed much more vegetation along the shoreline than six years previously, and this was documented photographically. The same photographs also revealed a significant reduction in the number of rocky areas, as well as the size of the remaining rocky areas over the last six years. The river appeared wider and deeper than previously.

We found 11 blotched water snakes, *Nerodia erythrogaster transversa* (10 of which appeared to be yearlings; the other a 2-year-old), three cottonmouths, *Agkistrodon piscivorus leucostoma*, two diamondback water snakes, *Nerodia rhombifer* (including a large gravid female), and one red-striped ribbon snake, *Thamnophis proximus*. These were found in places where previously Brazos water snakes had been found. Only the one adult female Brazos mentioned above was found during this river survey, and she did not appear to be gravid. The results are summarized in Table 1.

The average size of the 1-year-old blotched water snakes in this sample was 36.6 cm (snout–vent length) and their average weight was 39.3 g.

There were five food items regurgitated by the blotched water snakes. They were not identified but appeared to be some form of red-finned or yellow-finned minnows. They ranged in length from 3.8 cm to 6.4 cm and averaged 5.1 cm. The average weight of these fish was 1.2 g. The juvenile diamondback water snake regurgitated a similar fish measuring 5.1 cm.

Bacterial cultures of the mouth taken right at the time of

Table 1. Four-day / 20-mile snake survey of the Brazos River, mid-July 1999.

Species	Snout–vent length (cm)	Total length (cm)	Weight (g)	Estimated age (yrs)	Sex
Nerodia harteri harteri	70.5	91.4	275 (nongravid)	3+	F
Nerodia rhombifer	33.0	43.2	43	1	F
	81.3	94.0	605 (gravid)	3+	F
Nerodia erythrogaster transversa	34.3	45.7	45	1	M
	33.0	43.2	31	1	F
	34.3	45.7	32	1	M
	31.8	39.4	22	1	F
	38.1	50.8	40	1	M
	40.6	54.6	43	1	M
	53.3	71.1	126	2	F
	39.4	53.3	58	1	M
	41.9	53.3	50	1	F
	35.6	48.3	43	1	M
	35.6	47.0	35	1	M
Thamnophis proximus	40.6	57.2	21	1	M
Agkistrodon piscivorus leucostoma	not measured or weighed			1	?
				2	?
				3–4	?

capture or shortly thereafter revealed fairly uniform results. The sole Brazos water snake culture revealed a pure culture of *Aeromonas sobria*. The small diamondback water snake culture revealed *Aeromonas hydrophila*, while the adult diamondback culture revealed *A. sobria*. Two of the 1-year-old blotched water snakes cultured out only for *Aeromonas sobria* while two others cultured *A. hydrophila/caviae*. One of these 1-year-olds had no growth, which may have been an error in our procedure or the lab's. Interestingly, the 2-year-old blotched water snake cultured out only *Bacillus* sp. The ribbon snake cultured out a pure culture of *A. hydrophila/caviae*. Two separate labs were used and the results were fairly similar in both cases. It appears that these water snakes have oral flora dominated by the gram-negative bacteria of the *Aeromonas* group.

Neonates born in captivity and cultured within hours after birth cultured out a variety of gram-negative bacteria including *Pseudomonas aeruginosa*, *Klebsiella pneumoniae*, *Acinetobacter baumani*, as well as occasional *Staphylococcus* and *Streptococcus*. After one year in captivity, these same bacteria still dominated bacterial cultures, but the snakes appeared completely healthy. Several of those in the outdoor enclosure however cultured only *Pseudomonas aeruginosa* or *Aeromonas hydrophila*. It would appear that these otherwise well known veterinary pathogens are not pathogens in all of the water snakes examined so far, but rather normal oral flora for these water snakes. Gram-negative bacteria predominated in over 90% of the cultures we performed on both captive and wild water snakes.

Fecal exams performed on two of the blotched water snakes revealed only *Amoeba* sp. More fecal exams will be needed before any conclusions can be made with regard to parasites; however captive specimens of the Brazos water snake in our care commonly test positive for *Amoeba* sp. Perhaps for water snakes, these parasites may not be particularly pathogenic under most conditions or else they are commensals, but more work is needed.

Captive Breeding Project

On 4 August of this year, 35 marked baby Brazos water snakes were released at the site where their parents were captured nearly seven years ago. At that time we were granted a permit to collect several of these snakes for parasite studies. They grew up in captivity and began breeding. Then they had become part of a research project in Florida, and presently number over 30 one-year-olds and four adults. Those released

were 35 out of 44 neonates from these adults. This captive breeding project, being conducted over 1000 miles away, is comparing the growth, behavior and parasites of baby snakes in aquariums with those in large outdoor enclosures (the results of this study will be published in a separate paper). At the rate they are growing, hundreds or thousands may be produced over the next several years for possible release back into the river. In a cooperative study with the Texas Parks and Wildlife Department, the success of these babies will be monitored. These neonates, which are too small to pit-tag, were identified by branding combinations of the ventral scutes of the posterior abdomen. Until now, professional herpetologists have been very skeptical of the ability of captive born snakes to survive in the wild. Fortunately, there may be sufficient numbers available in this study to test this belief.

The introduction of an exotic disease has also been a concern. Indeed, the neonates released appear to be the product of a healthy, long term captive population, and they had been fed nothing prior to their release. Preliminary studies indicate the oral bacteria in the mouths of these captives do not differ significantly from those of wild snakes. Furthermore, their rapidly flowing and changing watery environment would seem to reduce the risk of horizontal disease transmission.

Future releases may include "head-started" individuals as well as neonates. Perhaps these released animals will contribute to the stability and survival of the local population. Long term survival may depend upon some habitat restoration however, as well as public education.

Discussion/Summary

The Brazos water snake appears to have shown a decrease in numbers recently, and this has a number of herpetologists concerned. While it is too early to determine if this is just a cyclical or seasonal change, it is imperative that more surveys be initiated in order to determine the true status of this species. Our survey suggests that the habitat required for their survival has deteriorated rapidly in the last four years, and allowed other water snakes to occupy that disturbed habitat, directly competing with *N. harteri* for food and hiding areas. The presence of juvenile blotched water snakes in large numbers occupying the same rocks where Brazos water snakes were once numerous suggests that they are replacing that species. These snakes were not just utilizing the hiding areas. They were also foraging in these areas; five contained relatively undigested fish.

The authors would like to point out that the Brazos water snake is classified as threatened under Texas law and may not be collected without a permit. This level of protection however does little to help restore the habitat or to prevent the locals from killing these snakes on sight, since they believe these tan and pinkish colored snakes to be copperheads.

A fortuitous captive breeding program, initiated for research purposes has produced over 40 neonates in each of the last two years. This August, 35 marked neonates were released at the site where the parents were captured. It should also be noted that our research was initiated solely for the purpose of studying the value of an outdoor enclosure for rearing snakes, and comparing these animals with wild specimens of the same age and species. We became concerned when we could find no wild animals in this age/size range during the final phase of our study. The only logical next step, which may also have some conservation value, was to release some of these animals. Furthermore, these animals are genetically equivalent to those raised in our outdoor enclosure and aquariums, so they would be the best choices from a comparative standpoint. We are fully aware of the risks involved in such a project, and we have made every effort to ensure that only parasite free and disease free animals are released. Bacterial cultures we performed on both wild and captive water snakes suggest that gram-negative bacteria predominate in the oral cavity and that these are not pathogenic for the species examined. It would appear however that perhaps this species is at a lower risk than others with regard to disease transmission. Its present low density, solitary nature and rapidly flowing, constantly changing environment would probably reduce the risk of disease transmission considerably.

It is our goal to make others aware of the plight of the Brazos water snake, so that measures can be taken to correct the environment and restore the species to stability. If this captive breeding study can serve as a cushion against extinction during this process, so be it.

Acknowledgements

The authors would like to thank John Werler, Jim Dixon, and Andy Price for their advice, and Dick Bartlett for the information on his surveys. Dr. Tad Jarrett of the Brazos Animal Hospital in Mineral Wells allowed us to utilize his lab for culture submission and performing fecal exams. Cultures were performed by Antech and Idexx microbiology departments. We would also like to thank Paul Shinkawa and the Texas Parks and Wildlife Department for granting us a permit to conduct this research.

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Herpetology 1999

In this column the editorial staff presents short abstracts of herpetological articles we have found of interest. This is not an attempt to summarize all of the research papers being published; it is an attempt to increase the reader's awareness of what herpetologists have been doing and publishing. The editor assumes full responsibility for any errors or misleading statements.

SEXING NEONATE LITTLE WHIP SNAKES

G. Turner [1999, Herpetofauna 29(1):10-12] notes that probing to determine sex can be unreliable in some immature snakes owing to their small size, and in the extreme may risk injury to the snake. A reliable alternative method was found for determining sex in neonate little whip snakes, *Suta flagellum*. The method relies on the semitransparency of the subcaudal scales allowing internal structures to be viewed. Sex is therefore determined directly from internal anatomical features. Wetting the subcaudal surface significantly improved its transparency. The region was wetted using a mist spray and the water droplets were then smeared over the surface. There were clear differences in internal structure between males and females as viewed through the wetted subcaudal scales. In neonate female *S. flagellum* a pair of pale brownish cloacal glands extend posteriorly from the cloaca—clearly no farther than 5 mm (range 3.0–4.5 mm; n = 34; as measured from the proximal edge of the vent scale). In males no corresponding structures were evident. Instead the hemipenes were indistinct and therefore of indeterminate length. All that could be discerned was a thin dark region along the midline. The author attributes this to the males' cloacal glands lying dorsal to the hemipenes and being of smaller size. The method is limited to neonates because the subcaudal scales of *S. flagellum* become increasingly opaque with age as pigment is deposited in them. The author is unsure whether this method can be successfully applied to other snake species. Although neonates of many snake species have a semitransparent ventral surface, whether cloacal glands or hemipenes can be adequately distinguished remains to be determined.

VENOMOUS SOUTH AMERICAN COLUBRIDS

U. Kuch [1999, Herpetozoa 12(1/2):11-16] notes that it is typically thought that when colubrid snakes bite, they must hold on at least several seconds to inject doses of toxic Duvernoy's glands secretion sufficient to cause envenoming in humans, and that quick defensive bites would not result in envenoming. However, some colubrid species are known to have caused envenoming by quick bites. Two species of the South American colubrid genus *Philodryas* can now be added to this category. A 13-year-old victim of a bite by *P. olfersii latirostris* developed local swelling, enlargement of axillary lymph nodes, joint stiffness in the upper extremities and the knees, and ecchymoses on the knees. This case demonstrates that *P. olfersii* is capable of inflicting systemic human envenoming with a quick defensive bite. The predominant symptoms following a quick bite by *P. chamissonis* inflicted on the same person 4½ years later, were numbness and coldness of the bitten arm, pain, slight swelling, and joint stiffness of hand and wrist. Previous records, and the rapid onset of envenoming after quick defensive bites, suggest that *P. olfersii* and *P. chamissonis* be regarded as venomous snakes in a clinical sense.

UV EFFECTS ON AMPHIBIAN EGGS AND LARVAE

A. Langhelle et al. [1999, J. Herpetology 33(3):449-456] tested the effects of ultraviolet radiation on hatching success, induced abnormalities and larval survival in three threatened (*Hyla arborea*, *Bufo calamita* and *Triturus cristatus*) and two common (*Rana temporaria* and *Bufo bufo*) amphibians of Sweden. In the laboratory, all species were exposed to artificial UV-radiation (intensities corresponding to midsummer conditions in Sweden) or visible light (controls) for ten days, during which hatching occurred. The effects of ambient levels of UV-radiation on hatching success and survival of *B. bufo*, *R. temporaria* and *B. calamita* were also determined during outdoor conditions when exposed to three different light regimes: full solar radiation; UV-filtered sunlight (exposed to photosynthetically active radiation only); or darkness. In the laboratory experiment, neither eggs nor larvae of *R. temporaria*, *B. bufo*, *B. calamita* and *H. arborea* were negatively affected by UV radiation. However, UV radiation induced darker pigmentation in tadpoles of *H. arborea*. Only one species, *T. cristatus*, showed reduced hatching frequencies and lower larval survival when exposed to UV radiation in comparison to visible light. However, since female *T. cristatus* wrap their eggs in macrophyte leaves, embryos are effectively protected against solar radiation. In the outdoor experiments, there were no differences between the light treatments for any of the species. Thus, none of these species are likely to be threatened by moderately increased levels of ultraviolet radiation.

BLUE-TONGUED SKINK FEEDING BEHAVIOR

T. L. Smith et al. [1999, J. Herpetology 33(3):362-369] note that squamate prey capture has evolved in two general directions; one toward an emphasis upon lingual prehension and the other toward an emphasis upon jaw prehension. In basal squamates (Iguania), lingual prehension characterizes prey capture. All other squamates (Scleroglossa) tend to use their jaws for prey prehension and the role of the tongue as a prehensile organ is reduced. However, within some scleroglossan lizards, lingual and jaw modes of prehension are present. Selection of a distinct prehension mode during a feeding bout in these lizards has been hypothesized to be related to prey size. To test for the presence of lingual prehension and correlation with prey size, the authors examined feeding behavior in the blue-tongued skink, *Tiliqua scincoides*, using two prey types (mealworm and cricket). They confirmed that this skink uses both lingual and jaw modes of prehension with accompanying characteristic jaw kinematic profiles. With crickets, only jaw prehension was exhibited, but both modes were used when feeding on equivalently sized prey, mealworms. Consequently, prehension mode is not exclusively elicited by prey size. The authors therefore hypothesize that selection of prehension modes, lingual or jaws, in these basal scleroglossans also includes proximate factors related to prey behavior.

PYTHON NATALENSIS IS A VALID SPECIES

D. G. Broadley [1999, African Herp News 29:31-32] notes that the last review of geographic variation in *Python sebae*, 15 years ago, revived *P. natalensis*, but only as a subspecies of *P. sebae*, based on a single specimen that seemed to be an intergrade or hybrid. Some python heads recently received from Tanzania confirm an extensive overlap of distributions of the two forms by about 900 km, with no further evidence of hybridization. Therefore, Broadley has decided to treat *P. natalensis* as a valid species. With regard to the English names for these two large pythons, Broadley is unhappy with the use of "African rock python," as these snakes show no particular association with rocky habitats. He proposes the use of "northern African python" for *P. sebae* and "southern African python" for *P. natalensis*.

A NEW MONTANE PITVIPER FROM MEXICO

M. A. López-Luna et al. [1999, Herpetologica 55(3):382-389] describe *Cerrophidion petlalcalensis*, a new species of small, terrestrial, montane pitviper from the Cerro de Petlalcala, Municipio San Andres Tenejapan, Veracruz, Mexico, 18°47′ N and 97°06′ W at 2100 m. The locality is in the extreme southern Sierra Madre Oriental, 10 km south of the town of Orizaba. The new species differs from other members of the genus in scalation, coloration, pattern and hemipenial ornamentation. The report describes a bite to the hand incurred by one of the authors while photographing a specimen of the new species. The venom appears relatively potent in that the bite was little more than a rapid scratch but swelling of the hand and forearm persisted for four days.

ACTIVITY PATTERNS OF POISON DART FROGS

B. M. Graves [1999, J. Herpetology 33(3):375-381] monitored the activity of *Dendrobates auratus* and *D. pumilio* in northeastern Costa Rica at 45 min intervals throughout daylight hours on nine days in late June and early July 1997. Activity of *D. pumilio* peaked early in the morning, declined steadily to midday, then remained at a relatively low level through the afternoon. Activity of *D. auratus* peaked in early afternoon, and was more consistent throughout the day than was activity of *D. pumilio*. There was a clear peak in use of elevated perches by *D. pumilio*, which occurred shortly after sunrise, although no such pattern was evident for *D. auratus*. A significant positive relationship between rainfall and activity was evident for *D. pumilio*, but not for *D. auratus*. These data demonstrate differences in activity patterns between these congeners, in spite of many ecological similarities.

A NEW SPECIES OF DWARF BOA FROM CUBA

S. B. Hedges and O. Garrido [1999, J. Herpetology 33(3): 436-441] describe *Tropidophis spiritus*, a new species from the province of Sancti Spíritus in central Cuba. This small, spotted, gracile species differs from all others in the genus by a combination of scalation, head shape, and color pattern. It is tentatively placed in the *semicinctus* group of gracile, boldly spotted species, but it does not appear to be closely related to any species in the genus.

PLEISTOCENE COLLARED LIZARDS

D. W. Hutchison et al. [1999, Herpetological Monographs 13: 81-141] report that recent paleontological evidence suggests the North American herpetofauna has been remarkably stable taxonomically and biogeographically throughout the Pleistocene. However, they use paleontological, ecological, and molecular genetic data to argue that the thermophilous and xerically-adapted collared lizard (*Crotaphytus collaris*) did not persist in the northern parts of its range during glacial phases of the Pleistocene. First, a careful review of the paleontological data used to support the stability model reveals no northern fossils unambiguously dated to glacial phases. Second, environmental conditions inferred for the Ozark Plateau and Flint Hills during glacial phases were not compatible with fitness requirements of collared lizards. Third, phylogeographic analyses of an intraspecific mtDNA gene tree suggest a recent invasion of the Ozarks and Flint Hills. Finally, microsatellite data are statistically consistent with a Holocene invasion but not with long-term occupation of the Ozarks or the Flint Hills by collared lizards. These combined data sets provide strong evidence that collared lizards are able to occupy northern parts of their range only during the warmer, drier interglacials. Other thermophilous and xerically-adapted reptilian species might be expected to show similar historical patterns.

TERRITORIALITY IN AN AUSTRALIAN SKINK

W. B. Jennings and G. C. Thompson [1999, Herpetologica 55(3):352-361] note that intraspecific aggression has not been reported for any of the 80+ species of the Australian scincid genus *Ctenotus*. During spring 1994, the authors made numerous observations of intraspecific aggression among captive and wild individuals of *Ctenotus fallens*, a species endemic to coastal Western Australia. Observed behaviors included aggressive displaying and biting. Subsequently they conducted a laboratory and field study of social behavior between August 1995 and March 1996. Additional evidence for intraspecific aggression was obtained from staged encounters between neonates in outdoor enclosures. Observed aggression suggests that individual residents do not tolerate intruders within their enclosures. A nearest neighbor analysis of adult male spatial patterns in the field revealed that males were regularly spaced, which is consistent with home range defense. A similar analysis on adult females also suggested regular spacing, but this result was not statistically supported. Incidence of fresh bite scars on individuals in the field depends upon reproductive status: 50% of sexually mature males and 50% of sexually mature females exhibited fresh bite scars whereas only 14% of juvenile lizards had fresh bite scars. Also evidenced by bite scars is that individuals of *C. fallens*, irrespective of cohort or sex, appeared to target the tail region for biting during intraspecific aggressive interactions. Tail autotomy from social interactions has potentially serious consequences, particularly for many Australian temperate-zone skinks, because the tail is the major lipid storage organ in species like *C. fallens* that lack abdominal fat bodies. The authors therefore hypothesize that *C. fallens* may exploit an opponent's tail as an "Achilles' heel" during aggressive interactions, confounding the interpretation that broken tails are primarily due to predation attempts.

Bull. Chicago Herp. Soc. 34(11):256-258, 1999

HerPET-POURRI

by Ellin Beltz

Some dinos run fast . . .

Gabrielle Lyon of Project Exploration writes "DinoRun Update: We won the Chicago Marathon Celebrity Online Challenge! With 42 percent of the votes (more than 600,000) we overwhelmed the competition. Votes came in from far and wide—almost every state in the U.S. as well as Japan, France, the Netherlands, and Great Britain. Paul [Sereno] ran an amazing race of 3 hours, 16 minutes and two seconds! It was his first competitive race and after nearly six months of intense training, he was thrilled. Not only did he come in with a very respectable time, but he also came in third of the `celebrity challenge pool.' Paul's time, in addition to his percentage of the online vote, gave him the best rank of the celebrities! The Marathon will award $7,500 to Project Exploration to build the new dinosaur! DinoRun fundraisers really made tracks! We've already received more than $6,300 (well beyond our goal of $5,000)—and checks are still arriving! Everyone is now waiting to learn the name of the new dinosaur. Not long now: We will be announcing the name and the scientific significance in mid-November at National Geographic Headquarters. Watch for the story! In addition, CNBC will air the National Geographic Explorer Documentary on November 14. We're delighted that this dinosaur (as well as a juvenile of the species and a carnivore from the same area and time period) will be on display for free starting January 14, 2000 at Navy Pier's Crystal Gardens. This exhibit, *Dinosaur Giants*, will showcase enormous skeletons—and include a tribute to all of the people who helped build the dinosaur. Thank you and go see *your* dinosaur. It's free. Keep an eye on <http://www.dinorun.org> for more information about the new dinosaur." [by E-mail] And set your browser on <http://www.projectexploration.org> for more about the Junior Paleontologists. Paul and Gabe threw a wonderful party yesterday for contributors to DinoRun. We saw the bones. We heard part of the name. We plaster-casted fossils, watched slides and nibbled cake and cookies whilst dreaming of that floodplain long long ago in a country far far away. Don't miss the show. These dinosaurs are cool!

One of the oddest stories of 1999

"I just had an interesting morning doing something that was not on my anticipated schedule. The New Mexico Department of Game and Fish got a call late yesterday afternoon from a business in the heart of downtown Albuquerque. Their maintenance worker found a taped-up plastic box in their dumpster labeled SNAKES. NMDGF retrieved the box and found it full of snakes bound for the dump in a sealed box. They called me and I got the box this morning with 137 *Thamnophis elegans* (wandering garter snakes) ranging from 257 to 822 mm SVL; 55 females/82 males. What a sick bastard who would box up that many snakes and put them in a dumpster headed for the dump!! Charlie Painter" Then arrived a clip from the *Albuquerque Journal* in which their columnist pointed out that there would have been a huge uproar if "somebody had chucked 137 puppies into the dumpster . . . [the] story would be on the front page, soon to be followed by offers to find homes for the abandoned. . . . CNN, MSNBC, People, Time, Newsweek, British tabloids and Oprah." But these were snakes, after all, and only special people enjoy that scene in Indiana Jones where he's just surrounded by Ophis in all her manifestations. The columnist pointed out that snakes are good for the ecosystem and tried to encourage some local people to support snakes in their yard. [October 17, 1999, from J. N. Stuart]

Too few of them or too many of us?

- *GreenLines* reports that: "A meeting of 60 of the world's leading turtle experts has `concluded that about half of the 270 turtle species around the world are in deep trouble'. . . . According to one scientist, `Half of the species will probably disappear in our lifetimes.' While 21 of the 55 species of U.S. turtles are protected by law or under consideration for protection, more than 7 million other turtles are exported annually as pets or for food. Sea turtles are the most endangered, but `many freshwater turtles—especially large river-based turtles—may not survive unless their habitats are better protected.'" [September 6, 1999, from Roger Featherstone]

- "A new Worldwatch Institute report finds that `more plant species are threatened in the United States than any other country—4,669 or 29 percent of all varieties'. . . . With some 30,000 plant species threatened worldwide and `thousands of plant species nearing extinction,' the number of natural cultivated varieties is also sharply declining largely due to the growing importance of genetic engineering in agriculture. In the U.S. `more than 80 percent of seed varieties sold a century ago no longer are available.'"

It's a global issue, now

- Eloise Beltz-Decker forwarded this piece from the *Chicago Sun Times* in which Richard Roeper vents one of his pet peeves: "There are two kinds of people in this world: Those who have exotic pets, and those who say, `Look at that attention-starved weirdo walking around with the cockatiel on his shoulder! What's his deal?' . . . Of course it's wrong and unfair to make sweeping generalizations damning anyone and everyone who indulges in a particular activity—but the truth is, I'm creeped out by anyone who has taken possession of a creature that goes beyond the normal, socially acceptable pet groups of dog-cat-goldfish-canary. . . . Many exotic pet owners can't resist showing off their prized animal companions. I've seen guys on the beach and women at flea markets with gigantic, brightly colored birds on their shoulders; men and women at parties with pythons and anacondas curled around their bodies; and people who walk around with ferrets or other sharp-teethed little monsters peeking out from their purses or jackets. Gross." There is more <http://www.suntimes.com/output/roeper/roep02.html>.

- Japanese government ministers tackled the issue of loose reptiles on the streets of Japan. As the number of people keeping exotic pets has climbed, so have the number of escapes, and the government is concerned that loose exotic animals could wreak havoc on what is left of that island nation's ecosystem. Japanese people like exotic pets because conventional Eurasian animals like cats and dogs are often banned in their cramped apartment complexes. The most

recent escapee was a snapping turtle, rounded up on a Tokyo street. [*Chicago Tribune*, October 3, 1999, from Emily Forcade]

Remember "-cide" means "killer"

Two new studies which cap 18 months of laboratory analysis on Minnesota pond waters suggest that "a combination of chemicals appears to be causing malformations of the frogs' limbs, eyes, mouths and other parts." These deformities are anatomically different from those now attributed to the development of nematodes in the joint buds reported here previously. The studies were published in the October issue of *Environmental Toxicology and Chemistry*, and are posted on <http://www.onwis.com/wi/100699/wi--deformedfrogs100699.asp>. The studies found that "deformities included skull and face defects and abnormal development of the mouth and eyes. Filtering the water to remove some of the chemicals reduced the deformities significantly. The most obvious deformities seen in Minnesota frogs have been twisted spines or malformed hind limbs and other problems such as webbed skin or missing digits." Perhaps the oddest finding was that some compounds are more toxic in natural ponds than the solutions prepared for the laboratory analysis. Several of these chemicals are believed to affect the thyroid gland which regulates growth, development and maturation in most animals. Whether these chemicals are affecting Minnesota's human population remains to be seen. [from Gary S. Casper, by E-mail] The nematode studies were published in *Science* and by Associated Press, April 30, 1999, from Ernie Liner].

Hopefully Alive

Little "Wanted" posters are being put up on trailheads in Colorado wilderness areas this year. Not for the new trend in outdoor experience, the serial murderer, but for an endangered amphibian. The state Division of Wildlife is seeking information on the boreal toad. Biologists hope that hikers will help tie down the distribution with pictures, tapes, letters and so on. Contact Mark Jones, Colorado Division of Wildlife, 317 W. Prospect Road, Fort Collins, CO 80526 (970-472-4361). [*High Country News*, Paonia, Colorado, September 27, 1999, from J. N. Stuart] It's to be hoped that they sell the posters in support of the project, too!

Don't believe everything you read here, either

Lisa M. Davis writes, "I now live in Michigan and am still a member of the CHS and I just received the October 1999 issue of the Bulletin. I was reading in [your column about] the Detroit Zoo article that was printed. I just completed my internship at the Detroit Zoo this summer and can report that the National Amphibian Conservation Center is not open at this time. It was due to open in September 1999, but it only has a few cement foundation walls up at this time. The new completion date is set for March 2000. By the looks of things they will be lucky if they make that deadline. This is not an official report from the zoo public relations department obviously, but you can verify with Andy Snider, the curator of herps there. . . ." Thanks for the heads up on an incorrect article, Lisa!

Ophiophobia or Ophiophilia?

- The Plymouth, Indiana, family who came home to find a giant snake (not theirs) wrapped around a cat in their basement had had enough. After many people tried to find and catch the animal, they had their home sealed and filled with poison which they were assured would kill the snake if it was still inside. The family had moved out of the house but moved back in after the poison was installed. [*South Bend Tribune*, October 17, 1999, from Garrett Kazmierski]

- Meanwhile people in Louisiana were enjoying reptiles at the first ever Louisiana Snake Festival at the Bluebonnet Swamp Nature Center in Baton Rouge. Visitors could pet pythons and learn about the state's native animals as well. [*Sunday Advocate*, May 23, 1999, from Ernie Liner]

Frog-nosticators

- Villagers in Beixing in Shaanxi Province, China, insist that the local frogs are better weather forecasters than the professionals on television. *China Review* reports, "If the large green frogs of the area rattle off a machine-gun like barrage of croaks, a gale will blow in six to eight hours. When the black and white-striped frogs with a flower-like pattern on their backs emit muffled croaks, a heavy rain will fall within two or three days. A small frog with black spots on its back can predict a drought. Most frogs are silent when it is raining, but the croaking of a small black frog signals a clearing. This unique phenomenon is not without scientific basis. Frogs in fact breathe through their skin and when temperature and atmospheric pressure change, they do vary their croaking patterns." [February 1999, from P. L. Beltz]

- Researchers in Baltimore have found that a dozen genes become more active during frogs' transformation from tadpoles to froglets. Previously it was thought that hormones were the only influence on tail resorption, this work showed that frogs with too much growth hormone just get fat and die fast. [*Science News*, July 17, 1999, from Mark Witwer and Emily Forcade]

Salamander Ecstasy

Mating male salamanders release a pheromone during courtship that makes the females more receptive to their amorous nose-nudging and spermatophore deposition. Quite a bit of the head-bobbing and head-tapping observed in courtship studies is now demonstrated to be the delivery of this pheromone from glands under the male's chin to the female. [*Science News*, September 18, 1999, from Mark Witwer]

Desert Gecko Storm

The American military seems to have a new view of "downsizing" these days. They now have a team studying small animals to find tricks and tips to use in the field. For example, gecko feet are being studied to determine how they climb up vertical surfaces and stick to ceilings so well. The end goal is to build wall-walking machines which could be used for maintenance, painting or spying. [*USA Today*, October 7, 1999, no name on clipping]

Now on your computer menu

"Tortoise Aid International has launched a petition drive to stop the abuse and sale of wild turtles in San Francisco's China Town. The use of wild turtles, both in the U.S. and overseas, for food and medicine is leading to a mass extinction crisis that

could see the loss of half of the world's 270 turtle species. The petition is on line at <http://www.tortoiseaid.org/sfpetition.html>," according to *GreenLines* #962. [September 21, 1999, from Roger Featherstone]

A long time ago...

The CHS ran a story about proposals to build a big dam down in the Grand Canyon and back up the Colorado in just one more damned lake. It didn't happen and the American conservation movement has grown ever since. Now, the *Los Angeles Times* reports that environmentalists are now trying to ban the use of motorized equipment in the Canyon because the "the hum of raft engines, the drone of sight seeing planes, plans for commercial development outside of the park and the roar of tourist buses," are in violation of federal laws which require "that areas deemed suitable for wilderness be managed as such, including a prohibition on mechanized equipment." [September 19, 1999, *GreenLines* from Roger Featherstone]

Thanks to everyone who contributes to these columns and to Ray Boldt, Walt Loose, Eloise Beltz-Decker, Wes von Papineäu, Bill Burnett, Ernie Liner and John Mason for items I enjoyed but couldn't use this month! You can contribute too. Send whole pages of newspapers, or if you must clip, be sure the date/publication slug is firmly attached with tape. Put your name on each piece, stuff in an envelope and mail to: Ellin Beltz, 1647 N. Clybourn Avenue, Chicago, IL 60614-5507. Letters to E-mail: ebeltz@ripco.com. I'm looking forward to hearing from you!

Unofficial Minutes of the CHS Board Meeting, October 9, 1999

The meeting was called to order at 7:40 P.M. Board members Karen Bielski, Jennie Picciola Marcia Rybak and Don Wheeler were absent.

Officers' and Committee Reports

The minutes of the September Board of Directors meeting were not available. Jack Schoenfelder's notes were read instead.

The Treasurer's report was accepted. Jack Schoenfelder reported that a completed Form 990 has been sent to the IRS.

Membership: Current membership is 852. Lori King disclosed plans to issue press releases for next year's meetings to help boost attendance and membership.

Shows: The CHS will participate in the Grand Opening of the Chicago Academy of Sciences Peggy Notebaert Nature Museum on October 22–24 and then in a special Halloween show the following Sunday, October 31. Jenny Vollman will not be available, so Joan Moore volunteered to organize these events.

Raffle: Gary Kostka reported the "best raffle income in years" at the September general meeting.

Library: The search goes on for a new Librarian.

Web Page: Lori King distributed copies of a written report from Marcia Rybak detailing progress on our website and future plans.

ReptileFest: Lori King is still working on getting a contract from Northeastern Illinois University for the venue for next year's 'Fest.

Nominating Committee: The committee's slate was presented to the board and will appear on an Absentee Ballot in the October *Bulletin*. The board discussed ways and means of increasing attendance at board meetings in an effort to expand the pool of possible candidates for office next year.

Awards Committee: Sergeant-at-arms Greg Brim will see to it that the awards are ready to be presented at the December meeting.

Old Business

Jack Schoenfelder has prepared and sent to the Chicago Academy of Sciences a formal proposal that the CHS begin holding its general meetings at the Notebaert Nature Museum beginning next year.

Bob Bavirsha has found a new site to store the CHS trailer and has moved it.

Lori King reported that destruction of the mangrove swamp on Utila Island has been stopped, thus preserving the only known habitat for *Ctenosaura bakeri*. Lori thanked everyone who sent letters in this effort.

Joan Moore reported on the parking situation at the Notebaert Nature Museum on weekday nights. She has checked several times and found ample free parking each time.

New Business

Lori King was excited to be able to report that WGN radio host Steve Dale has persuaded the management of PetSmart to cease all sales of baby iguanas.

Char Haguewood has volunteered to chair the host committee for the 2001 Midwest Herpetological Symposium, to be held in Chicago.

Round Table

Steve Spitzer reminded everyone that the membership secretary has a tough job and can always use help.

Lori King urged everyone to vote for Paul Sereno, who is running as a celebrity in the Chicago Marathon.

Gary Kostka thanked Marcia Rybak in absentia for all her work soliciting raffle donations and developing the CHS website.

The meeting adjourned at 9:14 P.M.

Respectfully submitted by Michael Dloogatch for Recording Secretary Karen Bielski

Bull. Chicago Herp. Soc. 34(11):259, 1999

My C.H.S. Field Trip to the Louisville Zoo: Part 3 – Komodo My House

by Gary Fogel
C.H.S. Treasurer / Cub Reporter

Upon leaving the back area of the Herpaquarium, I realized that everyone had gone elsewhere. I entered the front area of exhibits, only to be surrounded by a swirling mass of strangers peering into the glass enclosures. A mild wave of panic washed over me, just like when I was three years old, lost from my parents in the aisles of our local drugstore. Should I set out to try and find my traveling companions? Of course not! I opted instead, to make a beeline right for the zoo gift store! Whenever you are visiting a local attraction, there is nothing quite as important as checking out the gift selection. (You can quote me on that.) "Since I can't find anyone, let them find me instead!" I thought, realizing that no one would actually deem me important enough to send out a search party. "I know he was on the bus," someone will say, "I thought I saw one of his shoes right outside the bars of the lion's cage.

The zoo gift shop had the usual items. I settled for a hat, a naked mole rat T-shirt, and a rubber *Cyclura* lizard for Lori King. (Surprise!) Afterwards, I strolled the zoo grounds at my usual pace (95 mph) viewing the rest of the exhibits, elephants, sea lions and a few of my secondary traveling companions. I knew Lori wanted to take photos in front of the giant Jackson's chameleon statue at the Herpaquarium, so I headed back there, where I immediately ran into her snapping pictures. "Where have you been?" she quipped. It seems that while I was busy discussing sungazers, she was busy interacting with the Cuban crocodiles.

Keeper Bill McKenzie had taken a group behind the crocs' enclosure for a more personal encounter. He opened an underwater hatchway, through which the two 6-foot Cuban crocs swam, up to a platform enclosed by a chain-link fence, at eye level with the spectators. Lori was amazed at the interaction between the two crocodiles, as they seemed to converse with each other, while keeping a hungry eye on the group of C.H.S. members who were watching back. She said they had four distinct sounds: purring, chirping, clicking and roaring. They were then fed two large dead rats, which were pushed through the chain-link fence. They were quite lively and animated, moving about on the platform, and obviously recognizing their keeper. One can't be everywhere at once, so I concede I missed out on one of the best experiences, only to have to relate it to you readers here, secondhand.

At this point we took the photos at the chameleon statue (see photo—first installment). It was now time to venture to the life-size bronze statue of a Komodo dragon, anchored in the ground amidst the wood chips. Lori desperately wanted to take it home, but there was no way she could have gotten the 8-foot bronze sculpture into her chartreuse clutch bag. Taking photos with this beast proved to be tricky, as every child within 20 yards seemed drawn to the sculpture, each one taking turns sitting on its head! Lori and I eventually shooed all the children away long enough to take our photos. Even the most steely-eyed glare isn't enough to deter a child from Mr. Komodo dragon, and soon we were swarmed with children

once again. Photo-op finished, we wandered back to the gift store where we saw Gary Kostka with little son John, who was guzzling down some large carbonated concoction. (You didn't think he would escape my scrutiny in this installment, did you?) At this point, some peacocks strolled by, displaying their feathered foliage to the adoring crowds, while people snapped away with their cameras. I couldn't get any decent shots of the peacocks that didn't involve other people's feet in my viewfinder, so I stopped trying to take a picture of these showy birds.

Soon it was time to board the bus back to our metropolitan civilization. A group shot was taken, alongside the bus, which I have yet to see. Our trip back was much like the trip up, with the exception of having the sun setting off in the west, leaving the bus darkened as "The Relic" played on the video monitors. I still remember attending our general meeting at the Field Museum on one of the nights this movie was being filmed. It was odd to see the whole front of the museum lit up with floodlights in the darkened night. Just when you thought it couldn't get any more macabre, someone pulled out of their purse a video of Wallace & Gromit, that British claymation twosome, who, in this episode, not having any cheese for their crackers, build a rocket ship and go to the moon, to get some. "What next," I thought, "Cirque de Soliel hitchhiking down the interstate?" Sanity prevailed soon afterwards, as Mike Dloogatch popped in a video of his annual herping trip, 1998, this time in the Carolinas, featuring Steve Barten, Gery Hermann, Ralph Shepstone, Don Wheeler and other notable C.H.S. rat-packers. It was quite relaxing as they covered the countryside in search of pieces of tin to turn over. Many local reptiles were seen and videoed. Just as we were watching one of Dean Ripa's captive bushmasters beginning to swallow a rat whole, we reached our parked cars and our trip came to an end. It was now 11 P.M., and this cub reporter was exhausted as he was driven to the confines of his final destination. Good night to all, till our next bus trip. Until that time, readers . . . until that time!

Herps in Hollywood

by John Kostka

King Cobra

Nowadays, there isn't an original idea to be found in Hollywood. I assumed that *King Cobra* would conform to that standard. I was right.

The film's plot, which I'm sure everyone is all too familiar with, has been recycled beyond the point of usage, but just in case one of you was studying salamanders in a cave for the last 50 years, I'll summarize it.

The film begins in a lab, where scientists are conducting research on aggression. They have created a hybrid of a king cobra and a diamondback rattlesnake, because they claim that two of the most aggressive species of snakes (they're not *that* mean!) put together must be perfect for aggression research. Of course, through incompetence, (by a "scientist" who acts more like a rowdy junior high schooler during science class) the snake escapes, and relocates to a small community where it scares a boy (holding a rubber snake, of course) into a catatonic state.

This prompts the town doctor (who really looks like he spends more time at the gym than at the office) and his deputy girlfriend (who's moving to "the big city", whichever one that is) to investigate what caused this. They find a dead man (killed in an excruciatingly long and boring sequence) in his cabin (or shack), and deduce that the cause of death was snakebite, because there is a fang(!) lodged in the old man's body.

The doc orders a ridiculously large amount of antivenin, and so the production company takes the liberty of sending a herpetologist (Pat Morita) to see what's going on. Why does it seem to me like that wouldn't happen in real life?

Meanwhile, we find out that the town is holding its big annual money-making festival, which can't be shut down (this idea originated in *Jaws* and has been used in every cheesy "nature on the loose" movie since). This is told to us via *CHiPs* veteran Erik Estrada, whose attempts at a German (I think) accent are so pitiful that I could swear that there was a putrid stench emanating from my VCR. He manages to get out of the movie after that scene, probably gaining just enough cash to pay the landlord for another month.

Another couple is slaughtered as the *30-foot* king cobra attacks them *from a tree* (this king cobra can obviously suspend itself better than I can suspend my disbelief). The problem with this attack, though, is that the couple is Mexican—meaning they speak Spanish—and there are no subtitles (this might bother viewers who never learned Spanish, although the dialogue's probably not worth it anyway). I figure this can be attributed either to the funds running low in the editing process, or the actors not wanting others to hear them spouting such pitiful dialogue (I suspect the latter).

The doc's dad is eaten, and some police go looking around in the well-lit woods at night. There they find a snakeskin (which is thrown at them from off camera). Really!

The herpetologist, who is described as a snake expert (I can hear you lizard, turtle, amphibian and croc fans crying out for justice) finally arrives, and asks what they were doing breeding an *African* (oops!) king cobra and a diamondback rattlesnake together. But the movie gets worse! The snake can also spit venom, and has a spectacled cobra hood design, plus (though no explanation is given) it has grown in size. Amazing! It's four, four, four snakes in one!

They decide to conduct a search for the animal, to try to find and kill it, so off go the herpetologist, the doctor, the cop, and the snake's creator into the woods to try to capture this beast.

A group of "hunters" also go into the woods, having heard about the snake. They want to kill it (why is never explained), but they're dispatched within minutes of their arrival. A few cops also buy it (the snake *smashes through their car window with its head*!), but none of this is at all memorable.

Back with our heroes, we hear their ideas on how to capture the snake. One suggests trying to shoot it in the head with a gun. The herpetologist scoffs at this idea, and says that the best way to capture this thing is with "this" (holding up an oversized novelty snake hook). It's too bad we never get to see him use it!

That night, when asked for the story of his worst snakebite, the herpetologist tells his comrades that once, while handling a black mamba, it bit him, and the fangs went *through his hand.* So he milked the snake, pulled its fangs from his hand, and *then* called a doctor. (Real genius, huh?)

The next morning they set up an aluminum tube, with a goat on a stake a few feet from the one open end. We learn that the plan is to let the snake eat the goat, and that the herpetologist will then lure it into the trap, at which time his assistants will open the back door, and close the front. When he has escaped the tube, they will then proceed to close the back door, trapping the snake inside. Then poison gas will be vented in. (A plan this ingenious must have taken at least ten seconds to concoct.)

Needless to say, things do not go as planned, leading to the "thrilling climax" of the film.

I'd like to be blunt now, if I may. *King Cobra* is bad. Here's why:

First off, the effects. While I had a feeling from the start that they would be subpar, or worse than that, I was surprised to find that an effects team that has actually done decent work in other films (I'll spare them the embarrassment of mentioning their names) was working on this!

Probably the dumbest thing that happened in the film, though, is that after the battle with the snake, in which two major characters get bitten, we don't even get to find out if they survive or not! I guess the writers were to busy coming

up with hackneyed plot twists to concentrate on the flow of the story. Odd.

I would like to mention that, prior to seeing this film, I had read an article about it's making. One of the funniest lines in the article, for me, was a quote from one of the directors (yes, it took two people to make this piece of trash, and the same people wrote it, too!) "Any real-life herpetologist who saw how they go about capturing the snake would agree that it is entirely realistic." I didn't buy it for a second, and, as you can probably tell, I'm not close to being a herpetologist (if I were, do you think I would have the time to watch this tripe?)

Overall, *King Cobra* really let me down. I was expecting an evening of hilariously bad entertainment. And while the film did have amusing moments, it was way too long (like the snake), and it ended up being boring and nothing else. In short, it didn't have a leg to stand on.

This is supposedly a horror/thriller. It certainly wasn't thrilling, and the only thing horrific about it is that the creators are planning a sequel. Treat this like a dangerous animal and leave it alone!

Trimark Home Video, 1999, 93 min.

MPAA rating: PG-13 for: violence and some adult language

Coming Soon

Undated 2000—*Komodo* [Komodo Dragons]

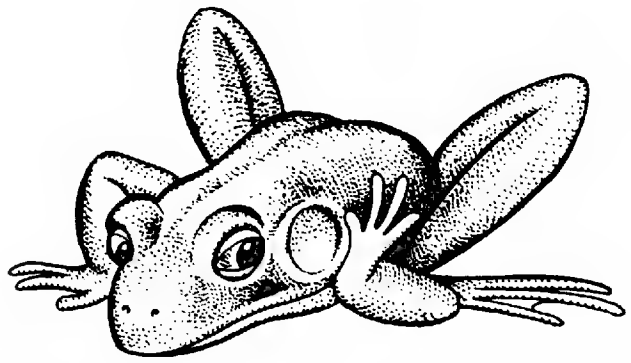
Undated 2000—*Python* [Python(s)]

Author's note: I am currently checking into other herp-related movies that are supposed to be coming out soon, but for now, they have been removed from the Coming Soon *section of this review.*

Bull. Chicago Herp. Soc. 34(11):261-262, 1999

The Tympanum

Dear Editor:



I'd like to comment on the letters published in the September *Bulletin* [33(9): 218-221]; the first from Randal Berry, the second a response from Dean Ripa. I don't know either of these men but it is apparent that they are colleagues, having worked in some degree of cooperation to establish successful husbandry techniques for bushmasters. What's shocking is that they would use a public forum (the *Bulletin*) to air their disagreements and even to attack each other's credibility.

Mr. Berry makes a mistake too often seen in this type of newsletter. He responds to and challenges (attacks) the work published by a colleague. This point by point dissection doesn't add to our knowledge because it focuses on points that are in dispute. It would have been far more useful for him to simply publish his own findings in an objective, scientific fashion. The readership is smart enough to realize that husbandry of these animals is not yet an exact science. What works for one person (in a given set of conditions) may be different from what works for another. Just tell us what worked and what didn't and keep conclusions to a minimum.

Mr. Ripa's problem is a different one. It's one thing to be defensive, but this guy went ballistic! Back in the days when I worked at a desk with E-mail at my fingertips, I often advised people who were angry over a particular memo to compose the nastiest response they could come up with. Believe me, this can be good therapy. The other part of my advice, of course, was to hit the "Delete" key at the final prompt. Mr. Ripa, unfortunately, hit "Send."

Lastly, I'd like to say that the publication of these two letters (or any similar pissing contest) does not serve the objectives of a newsletter. The *Bulletin of the Chicago Herpetological Society* sets a high standard of excellence among all regional society newsletters. Don't spoil it by allowing it to become a forum for airing dirty laundry.

Thanks for allowing me to voice a concern.

Rand Eagan, 3 Natty Pond Drive, Hubbardston MA 01452.

The Tortoise Reserve

Asian Turtle Conservation Effort

The Cuc Phuong Turtle Conservation and Ecology Project centered at the Cuc Phuong National Park in Vietnam has been identified by the AZA Chelonian Advisory Group and the Australian Association of Zoological Parks and Aquaria as a primary site for much needed regional conservation programs of Asian turtles. Cuc Phuong has established a multifaceted approach to turtle conservation addressing the serious impacts of the illegal wildlife trade of the region's turtles and tortoises. Aspects of the project include species reintroductions to protected areas, captive breeding for genetic preservation, conservation awareness, and research.

To help raise needed funds for Asian turtle conservation (and at this time all monies raised will be directed to the Cuc Phuong Conservation Project) the Tortoise Reserve has joined in on an Asian Turtle Conservation Effort. An account has been set up at the Tennessee Aquarium to receive donations for Cuc Phuong. To help jump start the effort the Tortoise Reserve will match one donation from any single herpetological society or turtle and tortoise club up to the amount of $1,000. Donations in any amount are encouraged. All donations will

be acknowledged and contributors will receive periodic updates on the program's progress. Donations can be made to the Asian Turtle Conservation Program and sent to Dave Collins, Asian Turtle Conservation Program Coordinator, Tennessee Aquarium, P.O. Box 11048, Chattanooga, TN 37401.

In order to help provide ongoing support beyond the fund-raising effort the Tortoise Reserve pledges all funds generated from its newly initiated sale of educational chelonian slide sets to the Asian Turtle Conservation Effort. Societies, clubs, and institutions can directly promote fund raising through sales of regional slide sets to members, or by offering them in museum, zoo, and aquarium gift shops. Annual reports on this program will be provided to all participating organizations.

Chelonian Slide Collection

The Tortoise Reserve is developing a photographic library of chelonians. At this time we have about 60% of the world's species represented, a cataloged collection of well over 7,000 images. These photos are available to anyone for noncommercial use. We distribute labeled, high quality, duplicate slides. These are intended for educational (projection) use but, on request, may be used in newsletters, on websites, and for other activities which promote turtle conservation. We simply request that the individual photographers and the Tortoise Reserve be acknowledged for each use. At this time we have good images of all North American species and subspecies and all the marine turtles. Our collection from other regions is less complete.

Photographers: To date over 50 natural history photographers have contributed to this program. You can help too. Photographers retain the copyright to all images and after we make duplicates original slides are returned. Images will not be available for commercial use and photographers are acknowledged.

Slides and Regional Slide Sets Available

These slide sets contain labeled slides of all species and subspecies known from a particular region. At this time two sets are available:

Turtles of the Northern and Central Atlantic States
(eastern Canada to Virginia) 29 slides $35

Turtles of the Carolinas
(North and South Carolina) 25 slides $30

Please provide an additional $3 for postage. Other regional slide sets will soon be available. Single slides are available at a cost of $2.50 each or $2 each in orders of 10 or more of different images. Inquire as to species availability and future regional sets. TorResInc@aol.com. All profits go directly to our Asian Turtle Conservation Effort.

Species Profile Series

The first turtle featured in our species profile series is the bog turtle (*Clemmys muhlenbergii*). Two versions of this slide program are available. A 100-slide version and a shorter 40-slide version. These slides come with an educational booklet which contains a detailed script for each slide. A second script for grade school groups is in preparation. Over 20 photographers and artists have donated their efforts to this program. It is cosponsored by the Baltimore Zoo, the Knoxville Zoo, and the U.S. Fish and Wildlife Service. In addition to an 18-slide series which introduces the turtle and its habitat there are sections on Life History, Zoogeography, an in-depth look at Habitat and Species Associates, and a series of 25 slides addressing Conservation Issues and Solutions. All profits from the sales of this set go to "Project Bog Turtle" and similar on-going bog turtle conservation programs. Cost $100 for the complete set, and $50 for the shorter one. Add $3 for postage. Both sets come with scripts.

Other current activities of the Tortoise Reserve

We oversee a red-footed tortoise captive breeding program. Over 1,000 adult tortoises, all confiscated from markets or donated by zoos, are used in a combination of research studies and educational programs. Hatchlings are sold worldwide in the pet trade and funds raised from the sales totally support the captive breeding as well as other reptile conservation projects in South America. Each year about 15% of the hatchlings (ones with parents of known origin) are head-started and released back into the wild. Our goal is to provide enough tortoises for the international pet trade so that red-footed tortoises will no longer be taken from the wild.

Endangered species programs in South America: One project supported by red-footed tortoise sales is a captive breeding and release program for Orinoco crocodiles. Only several hundred adults exist in the wild. Last year we hatched out and head-started 400 of these crocs. They will be released in about 18 months. Another project involves harvesting eggs and head-starting the endangered South American giant river turtle. To date we have released over 10,000 7- to 8-inch young back into the wild.

We are working with the government of the Bahamas on life history studies and conservation programs which involve two endemic freshwater turtles. One study is on Cat Island; the other on Inagua; an educational exhibit is being developed in Nassau.

The Tortoise Reserve makes annual contributions to individuals and non-government institutions for conservation in the form of awards and grants. In 1998–99 we made five such contributions ranging from $500 to $17,000. Examples include awards to the Baltimore Zoo, for an innovative educational bog turtle exhibit, and the Cleveland Zoological Society for an educational program on South American giant river turtles in Venezuela. Additionally, we have set up an endowment fund which will be used exclusively to provide annual scholarships for students working on chelonian conservation projects.

The Tortoise Reserve oversees a sanctuary program. We have cooperative agreements for management of wildlife sanctuaries in North Carolina, Arizona and Venezuela. Together they total over 35,500 acres of key wildlife habitats. **David S. Lee, The Tortoise Reserve, Inc., P.O. Box 7082, White Lake, NC 28337**.

Advertisements

American Federation of Herpetoculturists: A nonprofit national membership organization of herpetoculturists, veterinarians, academicians and zoo personnel involved in the captive husbandry and propagation of amphibians and reptiles. Membership includes highly acclaimed magazine, *The Vivarium*, dedicated to dissemination of information on herpetocultural accomplishments, herp medicine, breeding and maintenance, field studies and adventures, enclosure design and much more. AFH membership is $26. Send information requests to: AFH-News, P.O. Box 300067, Escondido CA 92030-0067.

For sale: rats and mice—pinkies, fuzzies and adults. Quantity discounts. Please send a SASE for pricelist or call Bill Brant, *THE GOURMET RODENT*, 6115 SW 137th Avenue, Archer FL 32618, (352) 495-9024, E-mail: GrmtRodent@aol.com.

For sale: murine-pathogen-free rats and mice available in all sizes, live or frozen: pinkies, fuzzies, crawlers, small, medium and large. Frozen crawler mice in lots of 2000, $.17 each. Also available, full grown hairless mice. FOB shipping point. Master Card accepted. Call (518) 537-2000 between 8:00 A.M. and 5:00 P.M. or write SAS Corporation, 273 Hover Avenue, Germantown NY 12526 for prices and additional information.

For sale: from **The Mouse Factory**, producing superior quality, frozen feeder mice and rats. New prices, new sizes, and now rats! Our mice and rats are vacuum-packed to greatly extend freezer life by reducing freezer burning and preserving vitamin and nutrient content. We feed our colony a nutrtionally balanced diet of rodent chow, formulated especially for us, and four types of natural whole grains and seeds. Mice: pinkies, $.25; fuzzies, $.30; hoppers, $.35; weanling, $.40; adult, $.45. Rats: starting with pinks at $.40 each, to XL at $1.80 each. Discount prices available. We accept Visa, MC, Discover or money orders. P.O. Box 85, Alpine TX 79831. Call us toll-free at (800) 720-0076 or visit our website: http://www.themousefactory.com.

For sale: from Bayou Rodents, excellent quality feeder mice and rats. Every size available. Pinks starting at $20/100. Orders are shipped by overnight service Monday thru Thursday. We accept Visa, MasterCard and Discover. For more info, contact Rhonda or Peggy, (800) 722-6102.

For sale: **high quality frozen feeders**. Over a decade of production and supply. Seven sizes of mice availabe: small newborn pinks up to jumbo adults. Prices start at $25 per 100. Feeders are separate in the resealable bag, not frozen together. Low shipping rates. Free price list. Kelly Haller, 4236 SE 25th Street, Topeka KS 66605, (913) 234-3358 evenings and weekends.

For sale: Herp bags—colors vary, translucent ripcord nylon, super lightweight, extremely durable construction with hot corners sewn in, double seamed. Custom sizes made upon request. Sizes: 46" × 14", $7 each; 24" × 12", $6 each; 24" × 6", $5 each. Shipping fees, $1 for first bag, $.30 each additional bag. Nicole Lechowicz, 2511 S. Illinois Avenue, #104, Carbondale IL 62901, (618) 457-2783.

For sale: 6' Neodesha cage, perfect condition, comes with BRAND NEW Pro Products radiant heat panel, an ideal cage for any large boa, python, or monitor, paid $500, will sell for $350; 6' Neodesha tortoise tub, brand new condition, great for box turtles, tortoises, etc., $50. Must pick up. All proceeds will be donated to the Lake Forest Wildlife Discovery Center. Rob Carmichael, (847) 615-4388, or E-mail: Carmichr@citylf.lfc.edu.

For sale: Lab cages—four 13×15×6½ for rats, $15 each; fifteen 7¼×11⅝×4¾ for mice, $10 each; eight 10×18¾×6 for mice, $10 each; four 13×15×6½, $10 each; twelve 9¼×10⅛ tops, mouse spacing, best offer. Snake cages (Cambro, food storage boxes)—seven 26×18×3½, $20 each; eight 26×18×6, $25 each. Free wood shelving unit with purchase of the eight large cages. All prices negotiable; trades may be considered. Steve, (708) 754-4812.

For sale: European fire salamanders (*Salamandra salamandra*), c.b., well-started, $30 each. John McGrath, 3815 Evergreen, Columbia MO 65201, (573) 474-8183.

For sale: adult pair of Australian red-bellied turtles (*Emydura subglobosa*), $40/pair. Wayne Roepke, (847) 398-3733.

For sale: red-footed tortoises, babies hatched between January and April 1999, all doing great, growing well, $100 each. Call (918) 342-2159 before 10 P.M. CST please. [OK]

For sale: **Captive-bred *Uromastyx ornatus* and *Uromastyx acanthinurus*—***U. ornatus***, $400; ***U. acanthinurus***, $200—all F offspring, gorgeous, healthy babies from c.b. parents. My third season producing these jewels. Also, c.b. high yellow leopard gecko babies, $20; one male and one female c.b. leucistic leopard geckos (Rainwater bloodline), $100/pair. Audrey Vanderlinden at **Uromastyx Specialties**, (773) 836-2477 or E-mail: uromastica@aol.com.

For sale: c.b. yearling snakes—one male and three female variable kings, $50 each; female gray-banded king, $50; female striped gray-banded king, $150; female rusty Sonoran gopher, $75. Also, c.b. adult snakes—female black pine, $100; one male and one female albino Sonoran gophers, $200/pair. All prices negotiable; trades may be considered. Steve, (708) 754-4812.

For sale: Sinaloan milksnake hatchlings, $30; three San Gabriel Mountain rosy boas, yearlings, LeShock stock (Amazon Basics), $250/trio; redfoot hatchlings, from cherry head cross, $150. Marc, (815) 293-0989.

For sale: one male and one female corn snakes (*Elaphe g.guttata*), outstanding yearling pair from handsome Delaware stock. Male roughly 3', female about 2–2½', beautiful colors, lots of orange and red, $80/pair. Also, am seeking to correspond with individuals with an interest in snakes of the genus *Pituophis*, particularly the four pine Snakes, and the bullsnake. Serious inquiries only; those interested in generic inbred mutants need not approach.
Bart Bruno, (203) 773-9257, or E-mail: BBBrunoPmsayi@prodigy.net.

For sale: Great snakes, great service. Send SASE for list. Applegate, P.O. Box 338, Campo CA 91906, (619) 478-5123. E-mail: applesnake@juno.com. Website: http://www.applegatereptiles.com. Thank you, call me.

For sale: emerald tree boas born 9/3/99, $500. Also, frilled dragons, spectacular red phase/pure Australians. Check out http://www.frilleddragon.com. Pure Australians, $400–500/pair, Northern Territory reds/Australians, $700–900/pair. Ed Marino, (410) 557-9197. e.w.marino@worldnet.att.net.

For sale: yellow anacondas, c.b. 6/99 from 10' docile female, bright yellow with solid black spots, great eaters, $100 each; male jungle carpet python, stunning 2-year-old, "Lazik" bloodline, $250; black & white banded Cal. kings, $25; 50/50 high white Cal. kings, $50. Mark Petros, Strictly Serpents, (847) 854-3259 home, (847) 854-2992 work.

For sale: Send SASE to CRC, P.O. Box 0731, Las Vegas NV 89125-0731 for brochures and list of species available. Limited bookings available for guided tours of herpetological collection sites in Nevada. Call/fax (702) 450-0065. URL http://www.herp.com/crc/ E-mail: crcsafetie@aol.com.

Free to good homes: c.b. at the Wildlife Discovery Center, City of Lake Forest) diamondback water snakes from huge 5'+ wild-caught female (she delivered 45 babies), all doing very well and growing fast (and are actually tame). Feeding on forceps fed fish, live fish, and fish-scented pinkies. Must pick up. If interested, please contact Rob Carmichael, Program Manager, City of Lake Forest (Parks & Recreation), at (847) 615-4388, or E-mail: Carmichr@citylf.lfc.edu.

Tours: Adventure tours to Madagascar! Join **Bill Love** seeing and photographing fauna and flora, heavily herp-biased, across the world's least known mini-continent. Maximum fun & photo ops assured on every trip. Contact him at: BLUE CHAMELEON VENTURES, P.O. Box 643, Alva FL 33920. TEL: (941) 728-2390, FAX: (941) 728-3276, E-mail: blove@cyberstreet.com.

Advertisements (cont'd)

Tours: **Road-riding in Costa Rica!** Treat yourself to the trip of a lifetime! Learn about tropical herps, find them, photograph them, see where they live. **Greentracks, Inc.**, offers the best herpetological tours led by internationally acclaimed herpetologists and herpetoculturists. See the Amazon, visit cloud forests, experience the world's greatest rainforest, super sunsets and good company. Call (800) 9-MONKEY.

Video: *Rattlesnake Hunting*, a 60-minute video by a 30-year veteran collector. Don't miss this one! It's as close to being in the field as you can get. (Not a slick commercial production.) Send check or money order for $19.95 plus $3 postage & handling to: D. Wheeler, 2705 Sunset Trail, Riverwoods IL 60015. Allow 4–6 weeks for delivery.

Wanted: people interested in purchasing frozen mice of all sizes, and weanling rats, in quantities of 50+. Steve, (708) 754-4812.

Wanted: big-headed turtles; mata mata turtles; Mexican giant mud turtles (*Staurotypus triporcatus*); exceptionally large common snappers (45 lbs. & up); large alligator snappers (over 90 lbs.); spectacled caiman from Trinidad, Tobago and Surinam; dwarf caiman; smooth-fronted caiman; albino turtles (except red-eared sliders). Walt Loose, (610) 926-6028, 9:00 A.M. – 1:00 P.M. or after 11:30 P.M. Eastern Time.

Line ads in this publication are run free for CHS members — $2 per line for nonmembers. Any ad may be refused at the discretion of the Editor. Submit ads to: Michael Dloogatch, 6048 N. Lawndale Avenue, Chicago IL 60659, (773) 588-0728 evening telephone, (312) 782-2868 fax, E-mail: <MADadder0@aol.com>.

News and Announcements

Y2K MIDWEST HERPETOLOGICAL SYMPOSIUM

The 16th Midwest Herpetological Symposium will be hosted by the Kansas City Herpetological Society. It will take place October 13-15, 2000, at the Kansas City Airport Hilton. Speakers at the millennium symposium will include: Robert Applegate, author of *The General Care and Maintenance of Milk Snakes*; Bert Langerwerf, proprietor of Agama International, the largest lizard facility in North America; "Python" Pete Kuhn, breeder of dwarf monitors and rare pythons; Scott Stahl, D.V.M., 1999 President of the Association of Reptilian and Amphibian Veterinarians (ARAV); and Jeff Ettling, Curator of Herps and Aquatics, St. Louis Zoo.

Information is available through the Kansas City Herpetological Society, P.O. Box 118, Liberty MO 64069, (816) 468-5609 telephone, (816) 468-8441 fax. E-mail: nieves4@ibm.net.

Visit the CHS Website at
http://www.chicagoherp.org

It's where to find:

- Herpetological headlines
- Calendar of events
- Society information (membership, bylaws, back issues of the *Bulletin*)
- Contact information for board members and committees
- Book reviews
- Photos
- Grant awards
- Links to other herp sites

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UPCOMING MEETINGS

The next meeting of the Chicago Herpetological Society will be held at 7:30 P.M., Wednesday, November 24, at the Field Museum of Natural History, Roosevelt Road at Lake Shore Drive, in Chicago. The annual election of officers and members-at-large of the CHS Board of Directors will take place. After the elections, **Ron Humbert** will treat us to a selection of slides from past field trips, featuring many CHS members as well as some spectacular herps.

At the December 29 meeting, Shedd Aquarium research associate **Chuck Knapp** will speak to us about his work with endangered Caribbean rock iguanas.

We are required to use the entrance on the west side of the museum. **We are allowed to use the free parking lot to the west of the museum. Entrance to this lot is from McFetridge Drive, the wide street just to the south, between the museum and Soldier Field.** Public transportation is an option: the Roosevelt Road (12th Street) bus goes directly to the museum, thus providing a connection with the el and subway. This bus service runs until 11 P.M.

The Chicago Turtle Club

Chicago Turtle Club meeting dates have been changed to the last Sunday of the month. The next meeting will be Sunday, November 28, 1:00 – 3:30/4:00 P.M., at the North Park Village Nature Center, 5801 N. Pulaski, in Chicago. Meetings are informal. Questions, children and animals are welcome. Parking is free and there is no admission. For more info call Lisa Koester, (773) 508-0034 or visit the CTC website: http://www.geocities.com/~chicagoturtle.

DONATIONS TO THE SEPTEMBER 29 RAFFLE

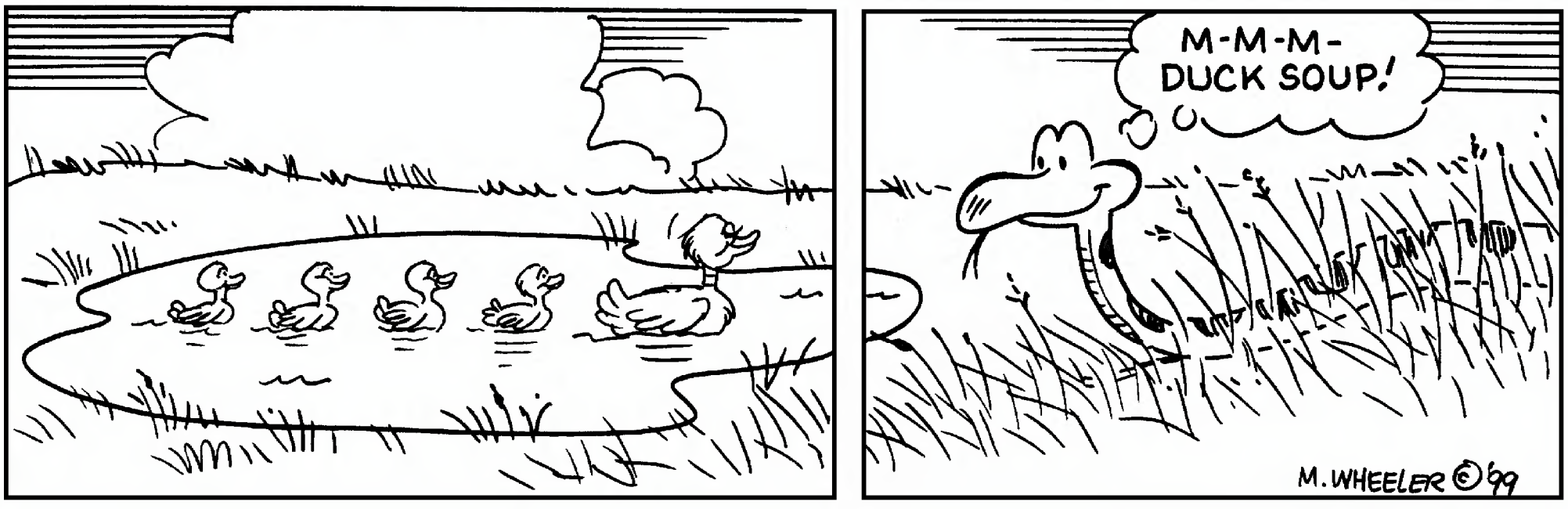
The following is a listing of those businesses and individuals who generously donated items for our monthly raffle at the September 29 meeting. The donated items are shown in parentheses.

Midwest Zoological Research (NutriBACdf supplement); TFH Publications (*Reptile & Amphibian Hobbyist* subscription); Timberline (fruit fly culture kit); Zoo Med (Repti-Temp 500 R thermostat); Four Paws (Nature's Reptile Vita-Spray); Super Pet (Hanging Gardens cage decor/ceramic dish); Fancy Publications (*Reptiles* magazines); Rep-Cal (bearded dragon food); Fluker Farms (Cricket Quencher); Reptile Emporium (InsectNside candy/Larvets Worm Snax); Ghann's Cricket Farm (cricket gift certificate); Pretty Pets (tortoise food); Top Hat Cricket Farm (coffee mug); Rainbow Mealworms (mealworm gift certificate); Rich Crowley–CHS Adoptions (lights & fixtures); Ron and Dotty Humbert (aquarium/driftwood cage decor); Jack Schoenfelder–Reptiques (Beanie Baby snake/toy turtle); Marcia Rybak (Budweiser party lights/snake pen); Ilene Sievert (cages/fishbowl).

MOVING??

Please let us know in plenty of time of any change in your mailing address. The *Bulletin of the Chicago Herpetological Society* is sent to our U.S. members by bulk-rate third class mail. This means that the U.S. Post Office will not forward your *Bulletin* with the rest of your mail. This is so even if you make a special request that your magazines be forwarded (such a request only applies to second class mail).

THE ADVENTURES OF SPOT



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